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# JOURNAL

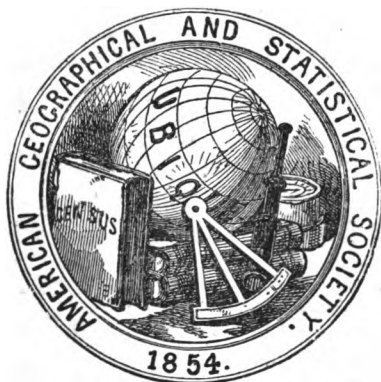
OF THE

AMERICAN

Geographical Society of New York.

M.DCCC.LXXII.

VOL. III.



EDITED BY THE RECORDING SECRETARY.

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ALBANY, N. Y.

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# STATE OF NEW YORK.

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No. 96.

## IN SENATE,

March 28, 1872.

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### ANNUAL REPORT

OF THE

AMERICAN GEOGRAPHICAL SOCIETY OF NEW  
YORK, FOR THE YEARS 1870-1871.

ROOMS OF THE AMERICAN GEOGRAPHICAL SOCIETY, }  
COOPER INSTITUTE, }  
NEW YORK, *March 25, 1872.* }

Hon. ALLEN C. BEACH,

*President of the Senate :*

SIR.—I have the honor to transmit herewith the Annual Report of the American Geographical Society of New York, for the year 1870-1871.

Very respectfully,

Your obedient servant,

DR. E. R. STRAZNICKY,

*Recording Secretary.*



# AMERICAN GEOGRAPHICAL SOCIETY.

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## OFFICERS AND COUNCIL, 1872.

PRESIDENT,

HON. CHARLES P. DALY, LL.D.

VICE-PRESIDENTS,

HENRY GRINNELL,

HON. F. A. CONKLING,

FRANCIS A. STOUT.

HONORARY SECRETARY,

REV. JOSEPH P. THOMPSON, D. D., LL.D.

FOREIGN CORRESPONDING SECRETARY,

HON. TOWNSEND HARRIS.

DOMESTIC CORRESPONDING SECRETARY,

W. H. H. MOORE.

RECORDING SECRETARY,

E. R. STRAZNICKY, M. D., PH. D.

TREASURER,

HENRY CLEWS.

LIBRARIAN,

ELIAL F. HALL.

COUNCIL,

WILLIAM REMSEN,

COL. T. BAILEY MYERS,

WILLIAM T. BLODGETT,

HON. WILLIAM E. CURTIS,

THEODORE W. DWIGHT, LL.D.,

LEWIS M. RUTHERFURD,

MAJ.-GEN. G. W. CULLUM, U. S. A.

GEORGE CABOT WARD.





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# ANNUAL REPORT

OF THE

## AMERICAN GEOGRAPHICAL SOCIETY.

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*To the Honorable the Legislature of the State of New York :*

In presenting this our first annual report, in conformity with the provisions of the act of April 8, 1871, the undersigned beg leave to say, that herein will be found embodied the Society's charter and amended charter, its by-laws, the list of officers, honorary, corresponding and resident members, its receipts, expenditures and financial condition, up to the present time ; the annual report of its Council, the reports of its various officers, the state of its library, and the papers read before it, containing a large amount of new and valuable information, especially in reference to the geography, the industrial and commercial interests, of our own country.

Respectfully submitted.

CHAS. P. DALY, *President.*

F. A. CONKLING,

*Chairman of the Council.*

HENRY CLEWS, *Treasurer.*

DR. E. R. STRAZNICKY,

*Recording Secretary.*

## CHARTER OF INCORPORATION.

---

GRANTED APRIL 13TH, 1854.

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*The People of the State of New York, represented in Senate and Assembly, do enact as follows :*

SECTION 1. George Bancroft, Henry Grinnell, Francis L. Hawks, John C. Zimmerman, Archibald Russell, Joshua Leavitt, William C. H. Waddell, Ridley Watts, S. De Witt Bloodgood, M. Dudley Bean, Hiram Barney, Alexander J. Cotheal, Luther B. Wyman, John Jay, J. Calvin Smith, Henry V. Poor, Cambridge Livingston, Edmund Blunt, Alexander W. Bradford, and their associates, who are now or may become hereafter associated for the purposes of this act, are hereby constituted a body corporate by the name of The American Geographical and Statistical Society, for the purpose of collecting and diffusing geographical and statistical information.

§ 2. For the purposes aforesaid, the said Society shall possess the general powers and privileges, and be subject to the general liabilities, contained in the third title of the eighteenth chapter of the first part of the Revised Statutes, so far as the same may be applicable, and may not have been modified or repealed ; but the real and personal estate which the said Society shall be authorized to take, hold and convey, over and above its library, and maps, charts, instruments and collections, shall not at any time exceed an amount, the clear yearly income of which shall be ten thousand dollars.

§ 3. The officers of the said Society shall be a president, three vice-presidents, a corresponding secretary, a recording secretary, a librarian, and treasurer, and

such other officers as may from time to time be provided for by the by-laws of the said Society.

§ 4. The said Society, for fixing the terms of admission of its members, for the government of the same, for changing and altering the officers above named, and for the general regulation and management of its transactions and affairs, shall have power to form a code of by-laws, not inconsistent with the laws of this State or of the United States; which code, when formed and adopted at a regular meeting, shall, until modified or rescinded, be equally binding as this act upon the said Society, its officers and its members.

§ 5. The Legislature may at any time alter or repeal this act.

§ 6. This act to take effect immediately.

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STATE OF NEW YORK, }  
*Secretary's Office.* }

I have compared the preceding with the original law on file in this office, and hereby certify the same to be a correct transcript therefrom and of the whole of said original law.

Given under my hand and seal of office, at the city of Albany,  
 [L. s.] this thirteenth day of April, one thousand eight hundred and  
 fifty-four.

A. G. JOHNSTON,  
*Deputy Secretary of State.*

## AMENDED CHARTER.

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PASSED APRIL 8TH, 1871.

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STATE OF NEW YORK, No. 237, IN SENATE, *March 7*, 1871.—Introduced by unanimous consent by Mr. Bradley; read twice and referred to the Committee on Literature; reported favorably from said committee, and committed to the Committee of the Whole.

## CHAP. 373.

AN ACT in relation to the American Geographical and Statistical Society.

PASSED April 8th, 1871.

*The People of the State of New York, represented in Senate and Assembly, do enact as follows :*

SECTION 1. The name or corporate title of the said Society shall hereafter be, The American Geographical Society of New York.

§ 2. The objects of the said Society shall be the advancement of geographical science; the collection, classification and scientific arrangement of statistics, and their results; the encouragement of explorations for the more thorough knowledge of all parts of the North American continent, and of other parts of the world which may be imperfectly known; the collection and diffusion of geographical, statistical and scientific knowledge, by lectures, printed publications or other means; the keeping up of a correspondence with scientific and learned societies in every part of the world, for the collection and diffusion of information, and the interchange of books, charts, maps, public reports, documents and valuable publications; the permanent establishment in the city of

New York of an institution in which shall be collected, classified and arranged, geographical and scientific works, voyages and travels, maps, charts, globes, instruments, documents, manuscripts, prints, engravings or whatever else may be useful or necessary for supplying full, accurate and reliable information in respect to every part of the globe, or explanatory of its geography, physical and descriptive; and its geological history, giving its climatology, its productions, animal, vegetable and mineral; its exploration, navigation and commerce; having especial reference to that kind of information which should be collected, preserved, and be at all times accessible for public uses in a great maritime and commercial city.

§ 3. The power given by the act hereby accorded to the said Society, to take, hold, convey, manage, and make use of its real and personal estate, shall be understood as authorizing said Society to take and hold by gift, grant, bequest, devise; subject to all provisions of law relative to devises and bequests by last will and testament, or purchase real estate to the value of three hundred thousand dollars, and to invest its income or its personal estate generally so as to produce a regular annual income sufficient for the accomplishment of the purposes set forth in the first section of this act; but said annual income shall not exceed twenty-five thousand dollars annually.

§ 4. The said Society shall make an annual report of its proceedings to the Legislature.

STATE OF NEW YORK, }  
Office of Secretary of State, }<sup>ss.</sup>

I have compared the preceding with the original law on file in this office, and do hereby certify that the same is a correct transcript therefrom and of the whole of said original law.

Given under my hand and seal of office, at the city of Albany,  
[L. s.] this twenty-second day of May, in the year one thousand eight hundred and seventy-one.

DIEDRICH WILLERS, JR.,  
*Deputy Secretary of State.*



## BY-LAWS.

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REVISED DECEMBER 9TH, 1869.

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## CHAPTER I.

## TITLE.

The title of the Society is, "The American Geographical and Statistical Society."\*

## CHAPTER II.

## OBJECTS.

The objects of the Society are, "the collecting and diffusing of geographical and statistical information."

## CHAPTER III.

## MEMBERS.

The Society shall consist of resident, non-resident, honorary, corresponding and ex-officio members.

1. Resident members are those residing in the city of New York, or its vicinity.

2. Non-resident members are those residing at least twenty-five miles distant from the city.

3. Honorary members shall be chosen on account of their distinction in the science of geography or statistics, and not more than twelve of them shall hereafter be elected in any one year.

4. Corresponding members shall be chosen from those who have aided the advancement of geography or statistics.

5. Ex-officio members shall be foreign diplomatic representatives and consuls, resident in the United States, and

\* Changed by act of April 8, 1871.

United States diplomatic representatives and consuls in foreign countries.

6. Resident, non-resident, corresponding and honorary members shall be elected as follows: All nominations of candidates shall be openly made in writing at a meeting of the Society, or the Council, by a member thereof, and, together with the name of the member making them, entered on the minutes. The persons thus nominated, when approved by the Council and elected by the Society, shall, on payment of the initiation fee, if nominated as a resident or non-resident member, and without such payment if nominated as a corresponding or honorary member, become members of the Society accordingly.

7. Persons entitled to become ex-officio members of the Society shall, on the recommendation of the Council, be by the Society constituted and declared to be such members.

8. The name of any member of the Society may, on the recommendation of the Council, and by a vote of two-thirds of the members present at a stated meeting of the Society, be dropped from the roll of its members.

## CHAPTER IV.

### INITIATION FEE AND ANNUAL DUES.

1. The initiation fee, including the dues for the current year, shall be, for a resident member, ten dollars; and for a non-resident member, five dollars; in both cases to be paid immediately on election.

2. The annual dues thereafter shall be, for a resident member, five dollars; and for a non-resident member, two dollars and a half; both to be paid in advance.

3. Any member of the Society, not in arrears, may commute for life all dues for membership, by the payment at one time, if a resident member, of fifty dollars; and if a non-resident member, twenty-five dollars.

4. The name of any resident or non-resident member of the Society, neglecting for two successive years to pay

his annual dues, or at any time wholly refusing to pay them, may by the Council be erased from the list of members of the Society.

5. The fiscal year of the Society shall, for all purposes, be the calendar year, that is, commence on the first day of January and end with the thirty-first day of December, in each year.

## CHAPTER V.

### OFFICERS.

1. The officers of the Society shall be a president, three vice-presidents, a foreign corresponding secretary, a domestic corresponding secretary, a recording secretary, a librarian, a treasurer and eight councillors; and these officers together shall form the Council of the Society.

2. The officers of the Society shall be chosen from among its members; they shall be elected annually by ballot, and shall hold their offices respectively until others are elected in their places.

3. All officers of the Society, to be chosen at any election, may be voted for on one ballot.

## CHAPTER VI.

### ANNUAL MEETING.

1. The annual meeting of the Society shall be held on the second Tuesday after the first day of January in each and every year hereafter, when the annual election of the officers of the Society shall take place; and if, from any cause, there shall be a failure of the annual election at the time above designated for that purpose, the same may be held on the Tuesday next following, that is, on the third Tuesday after the first day of January in each year, and of which due notice shall be given.

2. Every member of the Society, who has been such for twenty days or more, and who is not in arrears for his dues, shall be entitled to vote at the said election.

3. At the annual meeting of the Society, the Council shall present a general report of its proceedings and of those of the Society during the past year, and the secretaries and treasurer shall also present their annual reports.

## CHAPTER VII.

### MONTHLY AND SPECIAL MEETINGS.

1. The Society, unless otherwise specially ordered by the Society or the Council, shall hold its stated meetings for the transaction of business on the second Tuesday of each month of the year, except July, August and September.

2. The president, or in his absence one of the vice-presidents, may, and upon the written request of five members shall, call a special meeting of the Society, by giving three days' notice thereof in two daily newspapers published in the city of New York.

## CHAPTER VIII.

### ORDER OF BUSINESS.

1. At all stated meetings of the Society, for the transaction of ordinary business, the order of proceedings shall be as follows:

1. Reading of the minutes.
2. Reports and communications from officers of the Society.
3. Reports from the Council.
4. Reports from committees.
5. Nominations of members.
6. Special orders.
7. Unfinished business.
8. Miscellaneous business.
9. Papers read and addresses delivered before the Society.

2. All propositions presented for the action of the Society, at any of its meetings, shall be in writing, when requested by the presiding officer or any member. A

proposition thus presented, when seconded, and the question thereon stated from the chair, shall be deemed to be in the possession of the Society and open for discussion ; but may be withdrawn by the mover at any time before amendment or decision.

3. No member shall speak more than once upon the same question until all the other members present, desiring to speak, shall have spoken ; nor more than twice on any question without leave of the Society.

## CHAPTER IX.

### QUORUM.

At all meetings of the Society, nine members present shall constitute a quorum for the transaction of business.

## CHAPTER X.

### COMMITTEES.

All committees authorized by the Society shall, unless otherwise specially ordered, consist of three members each, and be appointed by the presiding officer.

## CHAPTER XI.

### PRESIDING OFFICER.

At all meetings of the Society, on the arrival of the appointed hour and the presence of a quorum, the president, or in his absence one of the vice-presidents, or in the absence of both a chairman *pro tem.*, shall immediately take the chair, call the meeting to order, and preside. He shall have only a casting vote. He shall preserve order and decide all questions of order, subject to an appeal to the Society. He shall also, unless otherwise specially ordered, appoint all committees authorized by the Society ; and at every annual election, before the opening of the polls, he shall appoint two tellers of the election.

## CHAPTER XII.

## SECRETARIES.

1. **Foreign Corresponding Secretary.** It shall be the duty of the foreign corresponding secretary to conduct the general correspondence of the Society with individuals and associate bodies in foreign countries.

2. **Domestic Corresponding Secretary.** It shall be the duty of the domestic corresponding secretary to conduct the Society's general correspondence with individuals and associate bodies in the United States.

3. Both the foreign and domestic secretaries shall keep, in suitable books to be provided for that purpose, at the Society's rooms, true copies of all letters written by them respectively on behalf of the Society, and shall preserve on proper files, at the said rooms, all letters received by them on the same account; and at each stated meeting of the Society or the Council they shall respectively report their correspondence and read the same, or such parts thereof as may be required.

4. In case of a vacancy in the office of either of the corresponding secretaries, or in the absence or disability of either of these officers, the duties of both may be performed by the other corresponding secretary.

5. The Society may designate a particular officer or appoint a committee to prepare a letter or letters on any special occasion.

6. **Recording Secretary.** It shall be the duty of the recording secretary to give due notice of the time and place of all meetings of the Society and to attend the same. He shall keep fair and accurate minutes of the proceedings of the Society, and record the same, when approved, in the Society's journal. He shall give immediate notice to the several officers and committees of the Society of all votes, orders, resolves and proceedings of the Society affecting them, or appertaining to their respective duties. He shall prepare a list of the members

of the Society entitled to vote, to be handed to the tellers before the opening of the polls at each annual election. He shall officially sign and affix the corporate seal of the Society to all diplomas and other instruments and documents authorized by the Society or Council. He shall have charge of the corporate seal, charter, by-laws, records and general archives of the Society, except so far as they may be expressly placed under the charge of others. He shall certify all acts and proceedings of the Society, and shall notify the Council of the death, resignation or removal of any officer or member of the Society. He shall have charge of the rooms of the Society, and shall perform all such other and further duties as may, from time to time, be devolved upon him by the Society or the Council. He shall receive for his services such salary or pecuniary compensation as shall be determined by the Society or the Council ; but neither in the Society nor the Council shall he have a vote on any question relating to or affecting his salary or pecuniary compensation.

7. All documents relating to the Society, and under the charge of the secretaries respectively, shall be placed in such depositories in the rooms of the Society as the Council may provide and designate for that purpose.

## CHAPTER XIII.

### LIBRARIAN.

The librarian, together with the Council, shall have the charge and arrangement of the books, maps and collections belonging to the Society. He shall cause to be kept in the rooms of the Society a registry of all donations to the library or collections of the Society, acknowledge their receipt by letter to the donors, and report the same in writing to the Society at its next stated meeting.

## CHAPTER XIV.

## TREASURER.

The treasurer shall have charge of and safely keep all contracts, certificates of stock, securities and muniments of title belonging to the Society. He shall collect the dues and keep the funds of the Society, and disburse the same under the direction of the Council ; and so often as the said funds in the hands of the treasurer shall amount to one hundred dollars, he shall deposit the same, in the name of the Society, in some incorporated bank in the city of New York, to be designated for that purpose by the Council ; and the said funds, thus deposited, shall be drawn out of the said bank on the check of the treasurer, countersigned by the chairman of the Council, and only for the legitimate and authorized purposes of the Society. The treasurer shall, previous to the annual meeting of the Society, prepare and submit to the Council, for audit, a detailed account of his receipts and disbursements for account of the Society during the past year ; and which annual account, duly audited, he shall present, with his general report, to the Society at its annual meeting.

## CHAPTER XV.

## COUNCIL.

1. The Council shall have the management and control of the affairs, property and funds of the Society, and shall designate an incorporated bank in the city of New York where the said funds shall, from time to time as they accrue, be deposited by the treasurer.

2. It may frame its own by-laws, not inconsistent with the charter or by-laws of the Society.

3. It may, from time to time, determine the salary or pecuniary compensation of the recording secretary, and shall also appoint the necessary agents, clerks and servants of the Society, with such powers, duties, privi-



leges and compensation as it may from time to time determine, and may at pleasure revoke such appointments, and make others in their stead.

4. It shall have power to fill, for the unexpired term, any vacancy that may occur in any of the offices of the Society.

5. It shall have power, at its discretion, to declare vacant the seat of any member of its own body (except the president and vice-presidents) who shall have been absent from its meetings for three successive months; and also, by a vote of a majority of the whole Council, to remove from its own body any member thereof for cause; but in such case it shall be the duty of the Council to report every such vacancy or removal to the Society at its next stated meeting thereafter, when such cases shall be subject to review by the Society.

6. It shall not, without an approving vote of the Society at a stated meeting thereof, make any contract whereby a liability in amount above one thousand dollars may be incurred by the Society, nor, without such vote, make any sale or disposition of the property of the Society, exceeding that sum in value.

7. The Council may, in its discretion, remit the initiation fee or annual dues of any member of the Society.

8. No member of the Council except the recording secretary shall receive any salary or pecuniary compensation for his services.

9. The Council shall hold stated meetings for the transaction of business at least once in every month, except the months of July, August and September.

10. At all meetings of the Council, five members present shall constitute a quorum for the transaction of business.

## CHAPTER XVI.

## GENERAL PROVISIONS AS TO DEBT.

No debt on account of the Society, beyond the funds in the treasury for its payment, shall, for any purpose, at any time be incurred ; and if at any time it shall appear that there are resting upon the Society pecuniary obligations beyond the funds in the treasury for their liquidation, no appropriation of funds from the treasury whatever, except for the necessary current expenses of the Society, shall be made until the said pecuniary obligations shall be fully discharged, or the funds necessary for their extinction shall have been set apart for that purpose.

## CHAPTER XVII.

## ALTERATION OF THE BY-LAWS.

No alteration of the by-laws of the Society shall be made unless openly proposed at a stated meeting of the Society, entered on the minutes, with the name of the member proposing the same, and adopted by the Society at a subsequent stated meeting, by a vote of two-thirds of the members present.

## CHAPTER XVIII.

## ADOPTION OF THE BY-LAWS.

The foregoing are hereby adopted and declared to be the by-laws of the Society ; and all by-laws of the Society heretofore adopted are hereby rescinded, and declared to be null and void.

## HONORARY, CORRESPONDING AND RESIDENT MEMBERS.

### HONORARY MEMBERS.

His Imperial Highness the Grand Duke Constantine of Russia, President of the Imperial Geographical Society, St. Petersburg, Russia.	MIDDENDORFF, Adolph Theo. von, Secretary of the Imperial Academy of Sciences of Russia, St. Petersburg.
His Majesty, Charles XV, Louis Eugene, King of Sweden and Norway, Stockholm.	PETERMANN, Ph. D., Prof. Augustus, Gotha, Germany.
FREMONT, LL.D., Jno. Chas., Mariposa, California.	QUETELET, Lambert Adolphe Jacques, President of the Central Commission of Statistics of Belgium, Brussels.
LAYARD, D. C. L., Austin Henry, London, England.	RAWLINSON, D. C. L., Sir Henry Creswicke, London, England.
LIVINGSTONE, D. D., LL.D., David.	STRUVE, Otto Wilhelm von, St. Petersburg, Russia.
MCCLENTOCK, LL.D., Francis Leopold, London, England.	
MAURY, LL.D., Matthew Fontaine, Washington, D. C.	

### CORRESPONDING MEMBERS.

ABBE, Prof., Cleveland, Cincinnati Observatory, Ohio.	BARTLETT, Jno. Russell, Providence, R. I.
ALEXANDER, John Henry, Baltimore, Md.	BASTIAN, M. D., A., President Geographical Society, Berlin.
ALFORD, U. S. A., Benjamin, Fort Vancouver, Washington Territory.	BAZ, Senor Don Juan Jose, Governor of the District of Mexico.
ALTAMIRANO, Senor Don Ignacio, Mexico.	BECKER, M. A., General Secretary Imperial Geographical Soc'y, Vienna.
ARCHBALD, Andrew B., Paris, France.	BEHM, Dr. E., Gotha.
BARCLAY, M. D., James T., Jerusalem, Syria.	BRADLEY, Rev. Daniel B., Siam.
BARNARD, LL.D., Henry, Hartford, Conn.	BRIGHT, M. P., John, London, Eng.
BARANDA, Senor Joaquin, Gov. of Campeche, Mexico.	BUSHNELL, Rev. Albert, Gaboon, Equatorial Africa.
	CARLOS, Senor Don Jose, Washington, D. C.

- CHAIK, Prof. Paul, Geneva, Switzerland.
- CHAMBERS, Hon. Wm., Edinburgh, Scotland.
- CIEROL, Senor Manuel, Gov. of Yucatan, Mexico.
- COLOGERAS, Hon. J. B., Rio Janeiro, Brazil.
- COOK, Charles W., San Francisco, California.
- DAVIS, Thomas E., Rome, Italy.
- DELAFLAINE, Geo. P., Madison, Wis.
- DIXON, Hon. James, Hartford, Conn.
- DRAPER, Lyman, Madison, Wis.
- DUER, Lieut. U. S. N., John K., Washington, D. C.
- DUNCAN, William H., Hanover, N. H.
- EMORY, U. S. A., Wm. H., Washington, D. C.
- FOETTERLE, Franz, late Secretary of the Imperial Royal Geographical Society of Vienna, Austria.
- GARDNER, J. T., Commissioner, Washington, D. C.
- GILMAN, LL.D., Daniel Coit, Yale College, New Haven, Conn.
- GREEN, Thomas J., Washington, D. C.
- GULICK, M. D., Luther Halsey, Micronesian Islands.
- GUYOT, LL.D., Prof. Arnold Henry, Princeton, N. J.
- HANCOCK, LL.D., William Neilson, Secretary Geographical and Statistical Society, Dublin.
- HAGUE, J. D., U. S. Commissioner, Washington, D. C.
- HEPBURN, M. D., Jas. Curtis, Siam.
- HELLWALD, Friedrich von, Member of the Imperial Royal Geographical Society, Vienna, Austria.
- HINES, Wm. E., U. S. Consul, Zanzibar, Africa.
- HOCHSTETTER, Dr. Ferdinand von, Professor in the University of Vienna, Austria.
- HOUGH, M. D., Franklin B., Superintendent of the United States Census Bureau, Washington, D. C.
- HUNT, LL.D., Prof. T. Sterry, Boston, Mass.
- JAMESON, M. D., Wm., Quito.
- JULIEN, Alexis A., Island of Sombrero, W. I.
- KENNEDY, Jos. Camp. Griffith, late Superintendent of the U. S. Census, Washington, D. C.
- KING, Clarence, Commissioner, Washington, D. C.
- LAPHAM, Increase A., Milwaukee, Wis.
- LACHLAN, R., Cincinnati, Ohio.
- LAMANSKY, Eugen von, Imperial Russian Geographical Society, St. Petersburg, Russia.
- LEAVENWORTH, Elias W., Syracuse, N. Y.
- LESSEPS, Ferdinand de, Suez, Egypt.
- LONG, Stephen H., Colonel U. S. A., Louisville, Ky.
- LYON, Hon. Caleb, Idaho.
- MCCARTEE, M. D., Divie Bethune, Hong Kong, China.
- MCCLELLAND, Robert, Wash., D. C.
- MACLAY, U. S. N., Wm. W., Annapolis, Md.
- MALTE BRUN, V. A., Honorary Secretary of the Geographical Society, Paris, France.
- MANSFIELD, Edw'd D., Commissioner of Statistics of Ohio, Columbus.
- MARISCAL, Senor Don Ignacio, of Mexico, Washington, D. C.
- MARSH, LL.D., Hon. George P., U. S. Minister, Florence, Italy.
- MARTIN, F. R. G. S., R. Montgomery, London, England.
- MARTIN, D. D., Rev. Wm. A. P., Professor of the Imperial College at Peking, China.
- MASON, Charles, Washington, D. C.
- MAUNOIR, Charles, General Secretary Geographical Society, Paris.

MAURY, Louis Ferdinand Alfred, Geographical Society, Paris, France.	PINHEIRO, M. D., J. C. Fernandes, Brazil.
NAPRSTEK, Vojta, Prague, Austria.	RAE, M. D., John, Hamilton, Canada.
NEGRI, Christoforo, President Italian Geographical Society, and Chief of the Consular Bureau, Foreign Office, Florence, Italy.	RIO DE LA LOZA, Senor Don Leopoldo, President Geographical and Statistical Society, Mexico.
NEWMARCH, Wm., Hon. Sec. of the Statistical Society of London, England.	RODGERS, Jno., Rear-Admiral U. S. N.
NORDENSKJÖLD, Prof. A. E., Stockholm, Sweden.	ROMERO, Hon. Mathias, Minister of Finance of Mexico.
NORMAN, Benj'n M., New Orleans, La.	SAPUCACHY, M. le Viscomte, Rio Janeiro, Brazil.
NYE, Gideon, U. S. Consul, Canton, China.	SCHADE, M. D., Louis, Wash., D. C.
OLIVIERA, B. de, Rio Janeiro, Brazil.	SCHLAGINTWEIT-SAKUNLÜNSKI, Prof. Herman von, Munich.
OLRIK, C. S. M., Royal Danish Inspector at Godhavn, N. Greenland.	SCHLAGINTWEIT-SAKUNLÜNSKI, Prof. Robert von.
PALAZIOS, Gen. Vicente Riva, Mexico.	SEWARD, LL.D., Hon. Wm. H., Auburn, N. Y.
PALMER, Aaron H., Washington, D. C.	SEYMOUR, LL.D., Hon. Horatio, Utica, N. Y.
PARDO, Senor Don Emilio, Mexico.	SHANKLAND, Thomas, U. S. Consul, Island of Mauritius.
PAYNO, Senor Don Manuel, Vice-President Geographical and Statistical Society, Mexico.	SIMMONS, M. D., D. B., Yedo, Japan.
PENNA, Senor Terreira, Para, Brazil.	SMITH, Edward R., Washington, D. C.
PERKINS, E. H., U. S. Consul, St. Croix, W. I.	SOMERVILLE, Mrs. Mary Fairfax, Florence, Italy.
PIMENTEL, Dr. Joaquin Xavier de Oliveira, Santarem Para, Brazil.	STEVENS, F. R. S., Henry, London, England.
POESCHE, Théo., Washington, D. C.	TEJADA, Don Sebastian Lerdo de, Mexico.
	WARNE, Joseph, Oxford, England.

## RESIDENT AND NON-RESIDENT MEMBERS, UP TO MAY 21st, 1872.

N. B.—Those having L. M. preceding their names have compounded for life.

Year of Election.	
1870	Abbe, George W., 8 Pine street and 32 E. Twentieth street.
1860	Acton, Thomas C., 32 Wall street.
1869	Aguiar (de), A. W. F., 13 Broadway.
1872	Alburtis, Edw'd K., Union Club, Fifth avenue.
1868	Allen, Charles C., 67 Exchange place.
1872	Allen, Horatio M., 25 Clinton place.

Year of Election.		
1869		Allen, Jerome, 3 East Thirty-third street.
1853		Alsop, Joseph W., 32 Washington square W.
1868		Appleton, William H., 549 Broadway.
1859	10	L. M. Arnold, Daniel H., 382 Fifth avenue.
1859		Arnoux, William H., 271 Broadway.
1856		Aspinwall, William H., 33 University place.
1870		Asher, Jno. R., 835 Broadway.
1871		Atterbury, Rev. Wm. Wallace, 37 Bible House.
1869		Auchmuty, Richard Tylden, 61 University place.
1859		L. M. Aymar, William, 37 West Twentieth street.
1869		Badeau, Gen. Adam.
1869		Bailey, James Muehlenberg, 11 West Twenty-eighth street.
1856		Baldwin, Simeon, 14 Wall street.
1868	20	Balestier, Joseph N., 112 Broadway.
1856		Ball, Henry, 565 Broadway.
1856		Baker, Francis, 69 Worth street.
1852		L. M. Bancroft, Hon. Geo., U. S. Ambassador, Berlin, Germany.
1868		Banks, Jr., David, 144 Nassau street.
1865		Banvard, John, Cold Spring Harbor, Long Island.
1869		Banyer, Goldsboro, 13 West Twenty-first street.
1868		Barlow, Gen. Francis C., 21 Park row.
1859		Barlow, S. L. M., 35 William street.
1858		Barney, Danford N., 82 Broadway.
1852	30	L. M. Barney, Hiram, 111 Broadway.
1868		Barrett, William C., 20 Nassau street.
1869		Barrow, John W., 350 Broadway.
1856		Bayard, M. D., Edward, 8 West Fortieth street.
1868		Beardslee, Rufus G., 106 Broadway.
1868		Beckwith, N. M., 4 West Sixteenth street.
1868		Beebe, Hon. Welcome R., 68 Wall street.
1857		Beekman, James W., 5 East Thirty-fourth street.
1870		Bell, George, 20 West Twentieth street.
1865		Bellows, D. D., Rev. Henry W., 232 East Fifteenth street.
1859	40	L. M. Belmont, August, 50 Wall street.
1868		Benedict, Erastus C., 64 Wall street.
1868		Bennett, James Gordon, 425 Fifth avenue.
1870		Bergh, Henry, 896 Broadway.
1868		Bernheimer, Adolph, 101 Franklin street.
1859		Bernheimer, Isaac, 320 Broadway.
1868		Bernheimer, Leopold, 66 Front street.
1868		Bernheimer, Simon, 218 West Fourteenth street.
1856		Berry, Richard, 291 Broadway.
1869		Bickmore, M. A., Prof. Albert S., Museum, Central Park.
1869	50	Bierstadt, Albert, 51 West Tenth street.

Year of Election.		
1868		Bill, Edward, 29 Moore street.
1868		Bishop, L.L.D., Nathan, 11 East Twenty-fourth street.
1870	L. M.	Bishop, T. Alston, 65 Fifth avenue.
1871		Bixby, John M., 461 Fifth avenue.
1866		Black, William, 565 Broadway.
1868		Blake, Charles F., 19 Park place.
1868		Bleecker, Jr., T. B., 61 William street.
1872		Blodgett, David C., 61 Fifth avenue.
1860		Blodgett, William T., 252 Pearl street.
1869	60	Bloomfield, William, 132 Nassau street.
1868		Blunt, George W., 75 South street.
1859		Boardman, Andrew, 322 Broadway.
1870		Body, John E., 54 Exchange place.
1871		Bolton, Ph. D., Henry C., 59 West Fifty-first street.
1859		Boorman, J. M., Scarborough, N. Y.
1870		Booth, Edwin, southeast corner Sixth avenue and Twenty-third street.
1857		Booth, Wm. A., 100 Wall street.
1856		Booth, Wm. T., 100 Wall street.
1870		Botta, Vincenzo, 25 West Thirty-seventh street.
1869	70	Brace, Charles L., 19 East Fourth street.
1869		Bradford, William, 51 West Tenth street.
1868		Brady, Hon. John R., 19 West Thirty-third street.
1856		Brevoort, J. Carson, Brooklyn, N. Y.
1872		Bridgham, Jr., S. W., 49 West Twenty-third street.
1862		Bristed, C. Astor.
1854	L. M.	Brodhead, John R., 8 West Twenty-first street.
1870		Brooks, Sidney, Newport, R. I.
1866		Brown, Ebenezer H., 121 Nassau street.
1859	L. M.	Brown, James, 59 Wall street.
1858	80	Brown, James M., 59 Wall street.
1856		Brown, Stewart, 59 Wall street.
1872		Brown, Walston H., 59 Liberty street.
1872	L. M.	Bryce, James, 119 East Eighteenth street.
1869		Burdett, Charles P., 174 Water street.
1871		Butler, Benj. F., 45 Exchange place.
1858		Butler, Charles, 12 Wall street.
1870		Butler, Cyrus, 24 Cliff street.
1857		Butler, Henry V., 62 Reade street.
1861		Butterfield, Gen. Daniel.
1859	90	Campbell, Malcolm, 27 Chambers street.
1868		Carter, James C., 66 Wall street.
1856		Carter, Robert, 530 Broadway.
1861		Cary, Lucius E. 90 Pine street.

Year of  
Election.

1863	L. M.	Cary, William F., 90 Pine street.
1870		Cassery, Bernard, Castle Garden, New York city.
1868	L. M.	Catlin, N. W. Stuyvesant, 45 William street.
1855		Chanler, Hon. Jno. W.
1859		Chapin, D. D., Rev. E. H., 44 East Thirty-third street.
1868		Chapman, Jos. H., 51 Wall street.
1871 100		Charlick, Oliver, 254 West Thirty-fourth street.
1868		Choate, William G., 49 Wall street.
1869		Churchill, Franklin H., 38 Pine street.
1868		Cisco, John J., 59 Wall street.
1872		Clark, E. V., Century Club.
1856		Clay, M. D., George, 56 Clinton place.
1859		Clift, Smith, 15 West Twenty-ninth street.
1864		Clews, Henry, 32 Wall street.
1856		Colgate, Charles C., 55 John street.
1852	L. M.	Colton, Joseph H., 78 Beekman street.
1868 110		Colyer, Vincent.
1869		Conger, Hon. Abraham B., 132 Nassau street.
1870		Conger, Clarence R., 34 East Twentieth street.
1872		Conklin, Eugene E., 432 Canal street.
1870		Conklin, William A., Museum, Central Park, N. Y. city.
1855		Conkling, Hon. F. A., 170 Broadway.
1856	L. M.	Cooley, James E., 78 Fifth avenue.
1856		Cooper, Edward, 17 Burling slip.
1855		Cooper, Peter, 17 Burling slip.
1871		Cooper, W. C., 132 Broadway.
1872 120		Corse, Israel, 104 Fifth avenue.
1868		Coulter, Samuel, 83 Chambers street.
1862		Cowdin, Hon. Elliot C., 98 Grand street.
1871		Cox, James F., 52 William street.
1872		Crawford, Maj.-Gen. U. S. A., S. W., Chambersburg, Pa.
1856		Crooks, Ramsey, 57 Front street.
1870		Cruikshank, LL.D., Jas., 164 S. Oxford st., Brooklyn, N. Y.
1869	L. M.	Cullum, Maj.-Gen. U. S. A., Geo. W., corner Greene and Houston streets.
1858		Currie, Gilbert E., 153 Broadway.
1857		Curtis, James L., 48 Pine street.
1856 130		Curtis, Lewis, 40 University place.
1856		Curtis, Hon. William E., 74 Broadway.
1856		Dabney, Charles H., 53 Exchange place.
1855		Daly, LL.D., Chief Justice Charles P., 84 Clinton place.
1871		Daly, Hon. Joseph F., 214 West Twenty-fifth street.
1865		Darling, Cassius, 595 Sixth avenue.
1866		Darling, William A., 69 West Forty-fourth street.



Year of Election.	
1870	Dash, John B., 47 East Nineteenth street.
1871	David, Laurens J., 4 Broad street.
1868	Davies, Hon. Henry E., 149 Broadway.
1870 140	Davis, Alex. J., 34 Waverly place.
1870	Davison, Edward F., 128 Pearl street.
1868	Dawson, H. B., Morrisania, N. Y.
1868	De Costa, Rev. B. F., 42 East Nineteenth street.
1867	L. M. Dennis, Charles, 51 Wall street.
1864	Detmold, Christian E., 111 Broadway.
1856	Detmold, M. D., William, 38 East Ninth street.
1868	De Voe, Col. Thomas F., 104 West Thirteenth street.
1859	Dickerson, E. N., 62 East Thirty-fourth street.
1864	Diehl, Israel S., 58 Reade street.
1870 150	Dinsmore, Wm. B., 59 Broadway.
1869	Dodge, Anson G. P., 61 Wall street.
1869	Dodge, Robert, 12 Wall street.
1856	Dodge, Hon. William E., 13 Cliff street.
1856	Dodge, William E., Jr., 13 Cliff street.
1856	Doremus, M. D., R. Ogden, 227 Fourth avenue.
1856	Douglass, Andrew E., 89 Wall street.
1868	Draper, M. D., Henry, 271 Madison avenue.
1871	Drexel, Jos. W., 53 Exchange place.
1870	Drowne, Henry T., 52 Wall street.
1868 160	Du Chaillu, Paul B., 48 East Thirtieth street.
1856	Duncan, Wm. Butler, 11 Nassau street.
1855	Dunshee, Henry W., 142 West Tenth street.
1870	Dunster, M. D., Edward S., Randall's Island.
1870	Durant, M. D., Thomas C., 20 Nassau street.
1868	Duyckinck, Evert A., 20 Clinton place.
1868	Dwight, LL.D., Prof. Theo. W., 43 Lafayette place.
1868	Edmonds, Hon. J. W., 271 Broadway.
1852	Elliott, M. D., S. M., 32 Waverly place.
1856	Elsworth, Henry, 223 West Fourteenth street.
1868 170	Emmet, M. D., Thomas Addis, 91 Madison avenue.
1869	Emott, Hon. James, 20 Nassau street.
1864	Evans, Walton W., 47 Exchange place.
1859	Evarts, Hon. Wm. M., 52 Wall street.
1853	Eyre, Henry S. P., 174 Pearl street.
1864	Faile, Thomas H., 130 Water street.
1856	Fernbach, Henry, 346 Broadway.
1856	L. M. Field, B. H., 127 Water street.
1854	L. M. Field, Cyrus W., Gramercy place.
1856	Field, David Dudley, 4 Pine street.

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1869	180	Field, Dudley, 4 Pine street.
1860		Field, Rev. H. M., 5 Beekman street.
1852	L. M.	Field, Hickson W., Europe.
1857		Fish, Hon. Hamilton, 104 East Tenth street.
1871		Fliess, William M., 47 Broadway.
1859	L. M.	Fogg, William H., 32 Burling slip.
1872		Foote, Horace A., 99 Water street.
1869		Forsyth, D. D., Rev. John, West Point, N. Y.
1859		Fowler, M. D., Edward P., 2 East Thirty-third street.
1868		Frohwein, Theobald, 218 Stanton street.
1871	190	Fry, Horace B., 12 Wall street.
1869		Furniss, William, New York, P. O. box 560.
1869		Ganse, D. D., Rev. H. D., 155 East Sixty-first street.
1853		Gaillard, Joseph, 34 South street.
1868		Gambrill, C. D., 57 Broadway.
1868		Gardner, M. D., A. K., 237 East Thirteenth street.
1868	L. M.	Gebhard, William H., Union Club, Fifth avenue.
1869		Gerard, James W., 17 Gramercy park.
1872		Gerard, Jr., James W., 45 William street.
1868	L. M.	Gerry, Elbridge T., 164 Nassau street.
1856	200	Gescheidt, M. D., Louis A.
1872		Gibbs, George, Newport, R. I.
1869		Gilbert, Clinton, 73 Sixth avenue.
1868		Gillies, James W., 237 Washington street.
1871		Gilman, William C., 46 Pine street.
1870		Goldman, Marcus, 4 West Forty-seventh street.
1868		Goldsmith, Jacob, 320 Broadway.
1870		Godon, U. S. N., Rear-Admiral Sylvanus W., 65 West Thirty-eighth street.
1870		Goodman, R., Lenox, Mass.
1872		Goulding, B. L., 347 Fourth avenue.
1870	210	Graham, Gen. C. K., 119 Broadway.
1860	L. M.	Graham, Jr., James L., 108 Broadway.
1859		Graham, R. M. C., 108 Broadway.
1868		Green, Andrew H., County Court-house.
1868		Greene, Gen. G. S., Washington, D. C.
1852	L. M.	Green, John C., 71 South street.
1857	L. M.	Greene, M. D., John W.
1856		Greenwood, Isaac J., 214 West Fourteenth street.
1868		Gregory, Dudley S., Jersey City, N. J.
1852		Grinnell, Henry, 45 William street.
1853	220	Grinnell, Moses H., 20 Union square.
1859	L. M.	Griswold, George, 72 South street.
1871		Groom, Wallace P., 350 Pearl street.

Year of  
Election.

1856		Guernsey, M. D., Egbert, 18 West Twenty-third street
1864		Guernsey, M. D., R. S., 150 Broadway.
1869		Habicht, C. E., 32 Wall street.
1869		Hadden, Jno. A., 33 Chambers street.
1871		Hall, Hon. A. Oakey, Mayor of the city of New York.
1868		Hall, Elial F., 37 Nassau street.
1869		Hallock, Mrs. Frances, 140 East Fifteenth street.
1869	230	Halsted, William M., 378 Broadway.
1872	L. M.	Hamersley, John W., 255 Fifth avenue.
1871		Hamilton, Jr., Alexander, 17 Washington square N.
1864		Hammond, Henry B., 20 Nassau street.
1871		Hand, Clifford A., 51 Wall street.
1870		Harris, R. Duncan, 91 Madison avenue.
1868	L. M.	Harris, Hon. Townsend, Union Club, Fifth avenue.
1870		Harrison, Prof. Thomas F., 146 Grand street.
1868		Hartt, M. A., Prof. Chas. F., Ithaca, N. Y.
1859	L. M.	Havemeyer, Jno. C., 385 West Fourteenth street.
1870	240	Havens, Charles G., 20 Exchange place.
1870		Hawkes, Prof. W. Wright, 27 S. William street.
1872		Hawley, E. Judson, 47 Fifth avenue.
1868		Hayes, M. D., Isaac I., 51 West Tenth street.
1869		Hays, William J., 51 West Tenth street.
1869		Hazard, Jr., Rowland R., 110 Broadway.
1868		Hegeman, William, 203 Broadway.
1868		Hegeman, William A. Ogden, 55 Pine street.
1859		Henderson, John C., 464 Broome street.
1856		Herring, Silas C., 251 Broadway.
1870	250	Hess, Julius, 20 Exchange place.
1856		Hewitt, Abram S., 17 Burling slip.
1868		Hewlett, John D., 51 Wall street.
1857		Heye, Ernest, 378 West Thirty-second street.
1872		Hoffman, William B., 48 West Twenty-second street.
1869		Hoffmann, Ph. D., Friedrich, 64 Sixth avenue.
1868		Hoguet, Robert J., 112 Duane street.
1870		Holmes, William H., 335 Broadway.
1858	L. M.	Holton, M. D., David P., 148 East Seventy-eighth street.
1856		Homans, Sheppard, 137 Broadway.
1868	260	Hoppin, William J., 59 Pine street.
1871		Howe, Col. Frank E., 47 Broadway.
1868		Hoyt, David, 286 Cherry street.
1865		Hull, Amos G., 41 Park row.
1870		Hunt, Charles H., 153 Broadway.
1856		Hunt, Wilson G., 82 White street.
1856		Hunter, James, 220 East Tenth street.

Year of  
Election;

1868	Huntington, Daniel, 49 East Twentieth street.
1868	Hurlburt, William H., World office.
1870	Hutchings, Hon. Robert C., 48 West Thirty-eighth street.
1869 270	Hutchins, Waldo, 40 Wall street.
1871	Huyshe, Wentworth, 59 Wall street.
1859	Ireland, John B., 200 Broadway.
1871	Jackson, H. A., 32 Wall street.
1868	Jacob, Ephraim A., 322 Broadway.
1870	James, Frederick P., 400 Fifth avenue.
1868	Jarvis, Nathaniel, Jr., 124 West Twenty-third street.
1852	L. M. Jay, Hon. John, U. S. Ambassador, Vienna, Austria.
1872	Joachimsen, Jos. P., 240 Broadway.
1855	Johnson, Bradish, 110 Front street.
1868 280	Johnson, Hezron A., 65 Broadway.
1868	Johnson, Henry W., 87 Wall street.
1856	Johnston, James B., 90 Broadway.
1868	Jones, Charles C., Jr., 61 Wall street.
1852	L. M. Jones, John D., 51 Wall street.
1871	Jones, Walter R. T., 65 Wall street.
1868	Joy, Prof. Chas. A., Columbia College.
1870	Kane, J. Grenville, 346 Broadway.
1870	Kaufmann, Sigismund, 39 Nassau street.
1855	Kearny, Edward, 139 Front street.
1869 290	Kelly, Eugene, 21 Nassau street.
1872	Kendrick, Col. Henry L., U. S. A., West Point, N. Y.
1865	Kennedy, John A., 135 West Twenty-second street.
1854	Kennedy, Robert L., 29 Nassau street.
1865	King, George, 5 Mercer street.
1863	King, Oliver K., 31 Broadway.
1852	Kingsland, A. C., 114 Fifth avenue.
1868	Kirkland, Hon. Charles P., 21 Nassau street.
1872	Klamroth, Albert, 64 St. Mark's place.
1853	L. M. Knapp, Shepherd, 33 Wall street.
1870 300	Kühne, Frederick, 51 Broad street.
1862	Lambert, M. D., E. W., 120 Broadway.
1868	L. M. Lane, Smith E., 169 Broadway.
1856	Lanier, J. F. D., 29 Pine street.
1871	Larremore, LL.D., Hon. Richard L., 352 East Fiftieth st.
1859	L. M. Lathers, Richard, 39 William street.
1868	Lawrence, Abraham R., 25 Nassau street.
1869	L. M. Lawrence, John S., 117 William street.
1852	L. M. Leavitt, D. D., Rev. Joshua, 3 Park place.

Year of  
Election.

1871		Lee, Ambrose, 877 Broadway.
1854	310	Lefferts, Marshall, 61 Broadway.
1859		Lenox, James, 53 Fifth avenue.
1868		Leonard, William H., 63 Wall street.
1868		Leslie, Frank, 537 Pearl street.
1871		Letson, Robert S., 68 South street.
1860		Lieber, LL.D., Prof. Francis, 48 East Thirty-fourth street.
1852	L. M.	Livingston, Cambridge, 145 Broadway.
1856		Lockwood, Le Grand, 94 Broadway.
1870		Loew, Hon. Frederick W., 618 Lexington avenue.
1857		Low, A. A., 31 Burling slip.
1870	320	Lyman, Edward H. R., 31 Burling slip
1863		Mackie, Robert, 24 Beaver street.
1868		MacKellar, William, 164 Nassau street.
1869		MacLane, Allan, in Europe.
1871		MacLay, Robert, 432 Canal street.
1869		MacLay, Hon. William B., 68 Second avenue.
1868		McClure, George, 15 Union square.
1871		McCreary, James A., 202 Broadway.
1868		McLean, James M., 156 Broadway.
1868		McLean, Samuel, 133 Duane street.
1870	330	McMillan, M. D., Charles, 4 East Thirty-fourth street.
1859		McMullen, John, 1212 Broadway.
1856		Manners, David S., 173 Broadway.
1870		Marbury, Francis F., 64 Wall street.
1872	L. M.	Marie, Peter, 48 West Nineteenth street.
1868		Marsh, Luther R., 170 Broadway.
1856		Marsh, Samuel, 98 Duane street.
1863		Marshall, Chas. H., 38 Burling slip.
1870		Marston, Charles E., 7 Broad street.
1868		Martin, Isaac P., 31 Nassau street.
1872	340	Martin, William, 70 West Thirty-fifth street.
1869		Martine, Randolph B., 31 Nassau street.
1868		Marquand, Henry G., 43 Wall street.
1868		Matsell, George W., 164 Nassau street.
1872	L. M.	Matthews, Edward, 4 Broad street.
1872		Maury, Rev. Mytton, Fordham, N. Y.
1863		May, Lewis, 1 New street.
1871		Mayo, M. D., William S., 208 Fifth avenue
1870		Menzies, William, 31 Nassau street.
1863		Merrick, John S., 805 Broadway.
1872	350	Meyer, F. William, 35 West Twenty-first street
1870		Miles, Edward D., National Park Bank.

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1869	Miller, Charles R., 607 Broadway.
1868	Miller, Edmund H., 20 Broad street.
1856	Minturn, T. R., 115 Pearl street.
1868	Mitchell, Grove P., 51 Wall street.
1871	Mitchell, Samuel A., 62 West Fourteenth street.
1856	Mitchill, Samuel L., 30 Broadway.
1856	Monroe, Ebenezer, 565 Broadway.
1868	Montgomery, Archibald G., Jr., 35 Wall street.
1869 360	Montgomery, U. S. A., Major James E.
1868	Moreau, John B., 14 Second street.
1859	L. M. Moore, Frank, Paris.
1853	L. M. Moore, LL.D., George H., New York Historical Society.
1869	Moore, Henderson, 43 Mercer street.
1863	L. M. Moore, W. H. H., 51 Wall street.
1856	Morgan, Hon. E. D., 54 Exchange place.
1865	Morgan, William D., 70 South street.
1859	Morrell, William H., 84 West Twenty-fifth street.
1870	Morris, Harry M., 49 West Thirty-eighth street.
1866 370	Morris, Robert R., New Rochelle, N. Y.
1868	Morrison, Henry, 260 Broadway.
1864	Morton, Levi P., 30 Broad street.
1860	Morse, LL.D., Prof. Samuel F. B., 5 West Twenty-second st.
1868	Mount, William S., 150 Duane street.
1869	L. M. Mount, Richard E., 335 Broadway.
1869	Mumford, John P., 2 East Thirty-seventh street.
1856	Murdock, U. A., 313 Fifth avenue.
1868	Murphy, Hon. Henry C., Brooklyn, N. Y.
1868	Murphy, Hon. Thomas, 38 East Thirty-ninth street.
1870 380	Murray, D. Colden, 62 South street.
1870	Myer, Bvt. Maj.-Gen. Albert J., U. S. A., Washington, D. C.
1870	Myers, Alfred G., 244 East Thirteenth street.
1852	Myers, Col. T. Bailey, 127 Mercer street.
1870	Naphègyi, Dr. G., 26 Park place.
1870	Neilson, William H., 54 William street.
1868	Newberry, M. D., Prof. Jno. S., Columbia College.
1856	Niblo, William, 50 West Twenty-eighth street.
1856	Nichols, Effingham H., 9 Pine street.
1868	Nicoll, Henry, 30 Pine street.
1859 390	L. M. Norrie, Adam, 303 Fifth avenue.
1870	Norton, Henry G., 26 Park place.
1871	O'Callaghan, LL.D., Edmund B., 651 Lexington avenue.
1869	O'Connor, Charles, 61 Wall street.
1868	Ogden, Alfred, 51 Wall street.

Year of  
Election.

1859		Ogden, William B., 52 Wall street.
1857		Opdyke, George, 25 Nassau street.
1869		O'Rielly, Henry, 187 McDougall street.
1871		Palmer, Courtlandt, Jr., 346 Broadway.
1868		Pardow, Robert, Jr., 68 Fifth avenue.
1872	400	Parish, Henry, 52 Wall street.
1869		Parker, John A., 39 William street.
1868		Parton, James, 308 East Eighteenth street.
1868		Paulison, Jno. P., 52 Wall street.
1871		Pavy, Octave.
1871		Peabody, Charles A., 167 Broadway.
1869		Perault, George, 292 Pearl street.
1868		Peyton, George, 52 West Thirty-third street.
1868		Pfeiffer, Carl, 113 Broadway.
1862		Phillips, George W., 120 Broadway.
1860	410	L. M. Phelps, Royal, 45 Exchange place.
1868		Philbin, Stephen, 82 Clinton place.
1855		Pierrepont, Hon. Edwards, 16 Wall street.
1852		L. M. Pierrepont, Henry E., 30 Broadway.
1852		L. M. Poor, Henry V., 68 Broadway.
1860		Potter, Hon. Clarkson N., 61 Wall street.
1871		Potter, Howard, 61 Wall street.
1868		Powers, William P., 74 Broadway.
1852		L. M. Prime, Frederick, 26 Broad street.
1859		L. M. Prime, Frederick E., 26 Broad street.
1868	420	Prime, Wm. C., 38 East Twenty-third street.
1869		Pruyn, LL.D., Hon. John V. L., Albany, N. Y.
1868		Pumpelly, Raphael.
1859		L. M. Punnett, James, 46 Wall street.
1859		Purser, George H., 82 Nassau street.
1868		Putnam, George P., 54 East Twenty-third street.
1870		Putzel, Mayer, 269 West Fifty-fourth street.
1857		Pyne, Percy R., 44 South street.
1856		Randolph, A. D. F., 770 Broadway.
1859		Rapallo, Hon. Charles A., 218 Broadway.
1868	430	Raven, Anton A., 51 Wall street.
1859		L. M. Reckendorfer, Joseph, 59 John street.
1868		Redfield, Amasa A., 20 Nassau street.
1856		Remsen, William, 26 Waverly place.
1868		Rhineland, Wm. C., 14 Washington square North.
1856		Richards, M. D., Joseph W., 12 Clinton place.
1868		Richmond, Henry A., Buffalo, N. Y.
1872		Rigney, Thomas, 31 East Thirty-seventh street.

Year of Election.		
1856		Riker, John H., 135 East Forty-sixth street.
1869		Robertson, John, Everett House.
1868 440		Roberts, Marshall O., 126 Warren street.
1872	L. M.	Robbins, Chandler, 116 West Twenty-first street.
1871		Robinson, Douglas, 52 William street.
1871		Robinson, Hon. Hamilton W., 5 East Sixty-fifth street.
1872		Roelker, Bernard, 57 Pine street.
1861	L. M.	Rogers, C. B., 280 Fifth avenue.
1869		Rogers, M. D., David L., 454 Lexington avenue
1869		Roosevelt, Theodore, 94 Maiden lane.
1868		Rose, Cornelius, 320 Broadway.
1854		Ruggles, Hon. Samuel B., 6 Wall street.
1868 450		Russell, John A., 264 Sixth avenue.
1870		Rutherford, Jno. A., 342 East Thirteenth street.
1854		Rutherford, L. M., 104 East Tenth street.
1869		Sabin, Joseph, 84 Nassau street.
1856		Sampson, Joseph, 2 Bond street.
1868		Sanger, A. L., 243 Broadway.
1869		Savage, John, Morrisania, N. Y.
1870		Schafer, Samuel M., 8 Broad street.
1870		Schafer, Simon, 52 West Forty-sixth street.
1859	L. M.	Schell, Augustus, 40 Wall street.
1870 460	L. M.	Schell, Richard, 22 West Twenty-first street.
1856		Schermerhorn, W. C., 68 Wall street.
1856		Schieffelin, S. A., Geneva, N. Y.
1869		Schmidt, Oscar E., 22 Burling slip.
1871		Schnerr, Constant, 40 Burling slip.
1856		Schuchardt, Frederick, 40 Exchange place.
1868		Schultz, Jackson S., 343 Pearl street.
1859	L. M.	Schultz, John H., 9 Spruce street.
1856		Sears, Herman B., 18 Maiden lane.
1870		Seligman, James, 21 Broad street.
1870 470		Seligman, Jesse, 21 Broad street.
1870		Seligman, Joseph, 21 Broad street.
1854		Sewall, Henry F., 78 South street.
1868		Seward, Clarence A., 29 Nassau street.
1871		Shaler, Maj.-Gen. Alex'r, 346 West Twenty-eighth street.
1868		Shea, Hon. George, 205 West Forty-sixth street.
1856		Sherman, W. Watts, 11 Nassau street.
1870		Sherwood, John, 60 Wall street.
1868		Sherwood, John D.
1870		Sistare, George K., 24 Nassau street.
1870 480		Slevin, Edward P., 120 Broadway.



Year of Election.	
1869	Slevin, James M., 120 Broadway.
1868	Smales, Holbert, 33 Wall street.
1868	Smith, Augustus F., 81 Nassau street.
1868	Smith, C. Bainbridge, 115 Broadway.
1853	Smith, M. D., James O., 81 Clinton place.
1870	Smyth, Frederick, 21 Nassau street.
1868	Spencer, Charles S., 8 Beach street.
1856	Spofford, Paul N., 29 Broadway.
1868	Squier, F. R. S., Hon. E. George, 135 E. Thirty-ninth street.
490	Stansbury, Edward A.
1859	Stallknecht, F. S., 37 Nassau street.
1856	Stebbins, Henry G., 40 Broadway.
1872	Steiger, E., 22 Frankfort street.
1871	Steinwehr, Brig.-Gen. A. von, New Haven, Conn.
1872	Stengel, Prof. Frederick, 51 East Twentieth street.
1870	Stephens, Edward, St. Cloud Hotel.
1872	Stern, Myer, 486 Broadway.
1869	Sterne, Simon, 35 Wall street.
1870	Stevens, Simon, 174 Chambers street.
1859 500	Stewart, A. T., 355 Fifth avenue.
1870	Stewart, Charles J., 51 Wall street.
1870	Stoughton, Charles B., 50 Clinton place.
1870	Stoughton, Edwin W., 70 Wall street.
1870	Stoughton, Henry E., 50 Clinton place.
1860	Stout, Francis A., 21 East Ninth street.
1870	Stout, John, 171 Broadway.
1858	Straznicky, M. D., Ph. D., E. R., Astor Library.
1869	Strebeigh, Robert M., 7 East Forty-fifth street.
1859	Strong, Geo. T., 68 Wall street.
1860 510	Stuart, Alexander, 167 Chambers street.
1855	Stuart, Robert L., 154 Fifth avenue.
1856	Sturgis, Russell, 90 East Tenth street.
1872	L. M. Stuyvesant, Rutherford, 104 East Tenth street.
1861	L. M. Suckley, M. D., George.
1868	Suydam, Henry, 51 West Twenty-second street.
1870	Swan, William H., 78 South street.
1857	Taylor, Bayard.
1868	Taylor, Douglas, 89 Nassau street.
1870	Taylor, George, Washington, D. C.
1869 520	Tellkamp, Herman D., 65 Broadway.
1855	Tellkamp, M. D., T. A., 142 West Fourth street.
1870	Tiedeman, Nicholas, 27 South William street.
1856	Tiffany, Charles L., 15 Union square.

Year of  
Election.

1868		Tilden, Hon. Samuel J., 15 Gramercy park.
1870		Tillman, Prof. S. D., room 22, Cooper Institute.
1870		Thomson, James, 69 Wall street.
1861		Thomson, M. D, Wm. H., 111 West Forty-third street.
1857	L. M.	Thompson, David, 52 Wall street.
1854		Thompson, D. D., LL.D., Rev. Joseph P., in Europe.
1856	530	Townsend, Randolph W., 247 Broadway.
1872		Tower, Maj.-Gen. Z. B., U. S. A., Army building, corner Greene and Houston streets.
1859.		Tracy, Charles, 50 Wall street.
1872		Tracy, William, 326 Fifth avenue.
1857		Tremain, Edwin R., 167 Broadway.
1872		Trueheart, James R., 13 East Twenty-eighth street.
1870		Tuckerman, Lucius, 90 Broadway.
1859		Turney, P. W., 110 Broadway.
1872		Tyler, Arthur W., Astor Library.
1872		Van Alen, Gen. J. H., 15 St. Mark's place.
1872	540	Van Alen, James J., 15 St. Mark's place.
1870		Van Brunt, Hon. Charles H., 63 Wall street.
1868		Van Cott, Hon. Joshua M., 15 Nassau street.
1869		Vanderpoel, Aaron J., 291 Broadway.
1872		Van Ness, Edward, 54 Wall street.
1868		Van Santvoord, C., 6 Hanover street.
1868		Van Vorst, Hon. Hooper C., 106 Broadway.
1859		Varnum, Joseph B., 110 Broadway.
1854		Viele, Gen. Egbert L., 115 Broadway.
1869		Vincent, Rev. J. H., 805 Broadway.
1854	550	Waddell, Wm. Coventry H., 11 Pine street.
1869		Wadsworth, E. Clifford, Brooklyn, E. D., N. Y.
1868		Walker, Wm. Augustus, 62 Wall street.
1869		Ward, Gen. Elijah, 561 Fifth avenue.
1859	L. M.	Ward, George C., 52 Wall street.
1870		Ward, Samuel G., 52 Wall street.
1870		Ward, Thomas W., 52 Wall street.
1856		Warren, James K., 35 Pine street.
1853	L. M.	Watts, Ridley, 22 East Twentieth street.
1854		Webb, William H., 200 Lewis street.
1869	560	Weber, M. D., Leonard, 38 East Twenty-seventh street.
1870		Webster, Sidney, 243 East Eighteenth street.
1866		Wendell, Jacob, 59 Worth street.
1869		Welles, James H., Fifth Avenue Hotel.
1872		Wells, Jacob, 5 Beekman street.
1868		Wells, J. H.

Year of  
Election.

1865		Wells, Samuel R., 389 Broadway.
1866		Westermann, B., 471 Broadway.
1870		Weston, Theodore, C. E., 120 Broadway.
1872		Wetmore, George C., 865 Greenwich street.
1854	570	L. M. Wetmore, Samuel, 59 Pine street.
1872		L. M. Wetmore, William B., Cadet, West Point, N. Y.
1870		Whitaker, Thomas A., Union Club, Fifth avenue.
1868		White, Alexander M., 68 Broadway.
1866		White, Hon. John H., 169 Broadway.
1868		Whitney, James A., 189 Broadway.
1868		Whitewright, Wm., Jr., 88 Wall street.
1871		Wilde, Samuel, Jr., Montclair, N. J.
1868		Williams, B., 41 East Thirty-eighth street.
1872		L. M. Williams, Stephen C., 268 Greene street.
1857	580	Wilson, Harris, 5 Dey street.
1870		Wilson, Gen. James Grant, 15 East Seventy-fourth street.
1860		Winston, Frederick S., 146 Broadway.
1854		L. M. Witthaus, G. H., 318 Broadway.
1854		L. M. Witthaus, R. A., 546 Pearl street.
1859		Wolf, John D., 13 Madison avenue.
1869		Wreaks, Charles F., 54 William street.
1870		Wright, E. Kellogg, National Park Bank.
1871		Youngs, Alfred, 41 South street.
1871		Youngs, Henry I., 78 South street.
1868	600	Zborowski, Martin, Morrisania, N. Y.

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PART I.

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TRANSACTIONS

OF THE

SOCIETY, FOR THE YEARS 1870, 1871 AND 1872.

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## TRANSACTIONS OF THE SOCIETY FOR 1870.

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Regular monthly meeting of the American Geographical and Statistical Society, Cooper Institute, New York, February 15, 1870. Chief Justice CHAS. P. DALY, the president, in the chair.

The minutes of the last meeting, January 25, 1870, were read and approved.

The Chairman of the Council, Hon. F. A. CONKLING, reported the following candidates as having been approved for election as

*Resident Members*—Hon. Charles H. Van Brunt, Hon. Frederick W. Loew, Hon. Robert C. Hutchings, and Messrs. Frederick Smyth, Jno. R. Asher, Wm. H. Holmes, Charles H. Hunt, and Bernard Casserly.

No ballot being called for, on motion they were declared duly elected members of the Society.

The treasurer's monthly report was presented, through the recording secretary, exhibiting a cash balance in the treasury of \$1,114.96.

The librarian's report for the past month was also read by the recording secretary, showing that ninety-four additions were made to the library by purchase and donation.

Both reports, on motion, were accepted and ordered to be placed on file.

The president then introduced to the Society, the Hon. E. Geo. Squier, who read a paper on the "Geography and Ancient Monuments of Peru." Before proceeding to read the paper, Mr. Squier presented to the Society a photographic copy of a map of the isthmus, by Lopez, cosmographer of the crown of Spain.

After the conclusion of the reading of the paper, on motion of Col. T. Bailey Myers, seconded by Mr. Conkling, the thanks of the Society were presented to Mr. Squier for his very interesting and instructive paper, and a copy of it was requested for publication in the journal.

On motion the meeting then adjourned.

Regular monthly meeting of the American Geographical and Statistical Society, Cooper Institute, New York, March 22, 1870. Chief Justice CHAS. P. DALY, the president, in the chair.

The minutes of the last meeting, February 15, 1870, were read and approved.

The Chairman of the Council reported the following candidates as having been approved for election as

*Resident Members*—Prof. Vincenzo Botta, Gen. Chas. K. Graham, Prof. S. D. Tillman, Gen. James Grant Wilson, Henry T. Drowne, John Sherwood, Sigismund Kaufmann, Sidney Brooks, Thomas C. Durant, John Stout, Samuel I. Jones, E. B. Moree;

And by Chief Justice Chas. P. Daly, as a

*Corresponding Member*—Admiral John Rodgers, U.S.N.

No ballot being called for, they were declared duly elected members of the Society, as nominated.

The treasurer, Henry Clews, Esq., presented his monthly report, exhibiting a cash balance in the treasury, of \$1,477.45.

The librarian's monthly report was read by the recording secretary, showing that one hundred and fifty-one additions were made to the library, by purchase and donation.

On motion, both reports were accepted and ordered to be placed on file.

Col. T. Bailey Myers, in offering the following preamble and resolutions, commemorative of the life and character of the late Hon. Anson Burlingame, who was an honorary member of this Society, and who died on the 23d of February, 1870, at St. Petersburg, said :

MR. PRESIDENT.—By the direction of the Council, I take leave to call the attention of the Society to the loss it has recently sustained in the death of Anson Burlingame, one of its honorary members and earnest friends. It is but a few months, sir, since he visited us here, and inspected our collections with the interest of a cultivated traveler, who had placed his foot in many lands, and could sympathize with our efforts to illustrate their geographical characteristics, and to foster further explorations. After a careful examination, he expressed his pleasure at what the Society had accomplished; but promised, on his return to China, to contribute such maps and charts as had been prepared by the geographers of that country, to illustrate its features, or as guides to their primitive navigators. That promise can never now be fulfilled; and the manly heart from which it emanated has ceased to beat.

Before submitting the resolutions, I beg leave to say a few words in reference to the character and achievements of the deceased.

In all the evidences of past usefulness; in the investigation of the mysteries of science, of the perilous adventures of navigators, and the bold explorations of travelers in far-off lands, with which these collections are enriched; perhaps there is nothing so wonderful and so suggestive to the intelligent student of history, as the brief career of Mr Burlingame.

Of humble origin, with no advantages of position, or family connections, his early years were passed in Michigan, then the ultima Thule of civilization (to which his father had migrated from New York), amidst the primitive forests of a land, the oldest settled portions of which were in their infancy when many of the nations of the old world, with which it was his future destiny to be identified, were already decrepit from age. A backwoodsman, a surveyor, and explorer for mineral wealth, we find him appropriating the first fruits of his labors in the west to the development of his mind. After reading law in Michigan, he further accomplished himself in his professional studies by a period spent in the schools at Cambridge. At an early age, he developed his fitness for political leadership; and when the exciting contest between Fremont and Buchanan held the attention of the nation, he threw himself into the canvass with his



accustomed energy. His forest eloquence, his brilliant wit and caustic humor, his independence, and, most of all, the cogency and power with which he put forth his arguments, coupled with his attractive and manly presence, soon fixed upon him the attention of his party, and placed him in a prominent position before the people of Massachusetts. That people, reversing the ordinary experience in a State which has given representatives to nearly all of her sisters, accepted Anson Burlingame, *born in New York, reared in Michigan*, as a member for *Massachusetts*, in the American Congress; as a representative in that body of a community, who have as rarely gone beyond their own borders for their law-makers, as had that far-off and self-contained race whom he was destined, in the future, to represent in another career—a concession won by the manly and genial qualities and high abilities, developed in his rough experiences in the west, and their subsequent moulding in the more refining culture of the schools. In the strife of words, and the estrangement of feeling between the north and south, which has since produced results which all good men deplore, the Senate Chamber was violated by a personal assault on a senator at the hands of a member of the lower house. In commenting on this grave violation of propriety, in his seat in Congress, it was Mr. Burlingame's fortune to draw upon himself the wrath of the offender, and to be called upon to retract, or to give satisfaction. Accepting the latter alternative, Mr. Burlingame selected the western rifle as his arbiter, and that weapon being distasteful to his opponent, as new to the code of chivalry, the meeting never ensued. This circumstance centered on Mr. Burlingame the attention of the people, and added to his reputation, as a bold and fearless champion of the views to which he was attached; and the moral question of dueling was overlooked, in the enthusiasm created by his readiness to sustain those views in a different arena.

After leaving Congress, Mr. Burlingame was selected for the important mission to China; which he filled with such ability and satisfaction to the timid and exclusive court to which he was accredited, as to be honored by them in turn with a counter mission, not only to his native country, but to the powers of the old world, which nearer approached in antiquity the venerable

government of which he became the representative. After fulfilling his mission to our own country with disinterestedness, fidelity, and zeal; after successfully visiting the courts of England and France, and playing the difficult role of an American and a republican, representing an empire and a despotism; he reached that of Russia, where, when he had but entered upon his duties, it was his destiny to fall a victim to a sudden illness on the 23d of last month.

That a citizen of the youngest of the grand nations of the earth should be honored by the oldest with so important a mission to his own country, was a rare and singular evidence of the confidence of a people who boast of their superior sagacity, cultivation and refinement, and who are as bigoted in their faith, as they are exclusive in their habits. That an American should have not only broken through the walls of stone, which were built to keep out such barbarians as he, but also that inner and stronger barrier of exclusiveness and self-complacency which has characterized the Chinese people from the time of Confucius, was truly an additional wonder of the world; but that this same American backwoodsman, an unbeliever according to the faith of either, should become the medium of communication between the Muscovite and Mongolian races, trusted and honored by both, is an evidence of progress which would seem to be incredible. If it had been an English diplomat who had been selected, bred in a school of political intrigue, facile and graceful in his approaches to a royal presence; if it had been a scion of that nation which has had such enlarged experience in diplomacy in the East; of which it may be said, as of Rome, that her legionary eagles are kissed by the sun in his whole meridian course; whose commerce whitens every sea; whose conquered empire in the East is larger than her inherited one at home; and whose career in those distant lands, if it has been illumined by the explorations of a Layard and a Livingstone in the cause of science, has been darkened by the despotism of a Warren Hastings, and whose guns are ever ready to back her diplomacy,—there might have been some pressure or interest, indirectly used on behalf of his government, inferred, with a view to a project of a protectorate, or the extension of her power, to account for the phenomena; and the suspicion of these would have lessened his usefulness.

The elevation of Mr. Burlingame—a simple citizen of a nation, free herself, and with no complicating alliance, or interest in continental intrigue—to this important mission, conceded solely to his personal popularity and open, manly bearing; and the want of jealousy displayed in his reception by the powers to which he was accredited, was alike a compliment from the old world to the new, and a recognition of the adaptability of the American character, which must have been gratifying to the friends of Mr. Burlingame, when living, and a consolation to them while they mourn his decease.

In consideration of these circumstances, I offer to the Society, on behalf of the Council, the following resolutions, intended to record their sentiments:

*Resolved*, That the members of the American Geographical and Statistical Society deeply deplore the loss which they, in common with the friends of progress, of scientific exploration, and geographical intelligence, have sustained in the decease of Anson Burlingame, one of its honorary members; who possessed both the opportunity and desire to open for their benefit the archives of the interesting people with whom he was connected, never before accessible.

*Resolved*, That they unite with the people of many nations, in regretting the loss by death, with his labors incomplete, of one who had secured the confidence of a race long self-excluded from a common intercourse and international relations, and whose last hours were devoted, as their representative, in producing reciprocal confidence and unity among men.

*Resolved*, That in return for the thousands of her subjects who have emigrated to the western coast of America, and whose labors have aided materially to develop the prosperity of an important section of the territory of the youngest of her sisters, China had received, in the person of Anson Burlingame, one, whose faithful and intelligent exertions were likely to yield her a full equivalent, and on whose early grave the tears of the Mongolian, Muscovite, Anglo-Saxon, and the Latin have just fallen in common sympathy.

*Resolved*, That a copy of these resolutions, signed by the secretary, be forwarded to the family of the deceased.

On motion of the Hon. Townsend Harris, these resolu-

tions were unanimously adopted, and it was ordered that a copy of them, signed by the recording secretary, be transmitted to the family of the deceased.

Wm. T. Blodgett, Esq., offered a series of resolutions on the death of Hon. Gulian C. Verplanck, a former member of this Society; which were unanimously adopted, and a copy of them likewise ordered to be transmitted to the family of the deceased.

The president then introduced to the Society Samuel P. Dinsmore, Esq., of New York; who read a paper on the subject of a canal across the American isthmus.

On motion of Mr. Amos G. Hull, the thanks of the Society were presented to Mr. Dinsmore for his very entertaining and instructive paper, and a copy of it was requested for the archives of the Society.

In moving the vote of thanks, Mr. Hull presented also the manuscript journal and estimates of Col. Childs' proposition for a canal across the isthmus.

Before the vote of thanks was taken, the Hon. E. Geo. Squier made a few remarks, stating that he had made the first survey of the San Juan river, and that in his opinion the only practicable route is that across Nicaragua, and that Darien gives no hope.

The President then conveyed the thanks of the Society to Mr. Dinsmore, and, on motion, the meeting adjourned.

Regular monthly meeting of the American Geographical and Statistical Society, Cooper Institute, New York, April 12, 1870. Chief Justice CHAS. P. DALY, the president, in the chair.

The minutes of the last meeting, March 22, 1870, were read and approved.

A report from the Council was read, recommending the outfit by the United States government of a new expedition for the discovery of the north pole, and Dr. Hayes, the eminent Arctic explorer, to its command.

On motion of Henry T. Drowne, Esq., seconded by Dr.

Hough, the report was unanimously adopted; and it was ordered that certified copies be transmitted by the recording secretary to both houses of Congress.

The Council further reported the following candidates as having been approved for election as

*Resident Members*—Frederick Kuhne, Hon. Horace Greeley, J. Alston Bishop, George Taylor, of Washington, D. C.; Charles E. Marston, Frederick M. Kelly, Cyrus Butler, Wm. B. Dinsmore, George K. Sistare, R. Goodman, James Cruikshank, LL.D., Brooklyn;

And by Chief Justice Chas. P. Daly, as

*Corresponding Members*—Prof. Clarence King, Washington, D. C.; Prof. J. D. Hague, Washington, D. C.; Prof. J. T. Gardner, Washington, D. C.

No ballot being called for, they were declared duly elected members of the Society, as nominated.

The treasurer, Henry Clews, Esq., sent in his monthly report, showing that there was a balance in the treasury of \$782.16.

The librarian, H. B. Hammond, Esq., sent his monthly report, showing that during the past month, four hundred and six accessions were made to the library of the Society, by purchase and donation.

Both reports, on motion, were accepted and ordered to be placed on file.

(TRANSLATION.)

*Letter from the President of the Belgian Geographical Society to the President of the American Geographical Society.*

ANTWERP, 14th January, 1870.

MR. PRESIDENT.—We have the honor to inform you that a Belgian Geographical Society has been established at Antwerp.

You will find inclosed the by-laws, such as they have been temporarily established, at a general meeting of its adherents, held at Antwerp on the 26th of December of last year.

Our young association will experience a great many difficulties before it can place itself in a position to follow, even at a great

distance, the glorious track of analagous societies which were founded many years ago, and which have marked their existence by so many and such important services to science, to commerce and to civilization.

If we only had consulted our strength and our resources, we should have despaired of being able to accomplish such a difficult task. But we have thought that we could reckon upon the sympathetic indulgence of foreign geographers and men of science, and upon the kind assistance of such societies, as are at the head of geographical movement.

We should be extremely obliged to you, if you would furnish us a list of distinguished persons of your body who would consent to accept the title of a corresponding member of our society.

We hardly dare to make to you the proposition of an exchange of your publications, statutes, rules, journals, bulletins, books, charts and atlases. We shall have, especially in the commencement, very little to offer in return for the scientific treasures which you may have at your disposition. But you will not ignore how difficult are all literary enterprises, and you may reckon upon our good-will.

We offer you cheerfully all the information which you may desire, and which may be of service to you, with regard to Belgium.

Please accept, Mr. President, the assurance of our most distinguished consideration.

*The President,*

CHAS. SAINCTELETTE, M. P.

*The Secretary,*

JULIEN LEYE.

The president then introduced to the Society, Capt. Chas. W. Raymond, of the United States corps of engineers, who read a paper on the Yukon River region, Alaska.

After the conclusion of the paper, on motion of the Hon. David Dudley Field, seconded by Hon. Chas. P. Kirkland, the thanks of the Society were presented to Capt. Raymond, for his very interesting and instructive paper, and a copy of it was requested for publication in the Journal.

REPORT OF COUNCIL: AMERICAN GEOGRAPHICAL AND STATISTICAL  
SOCIETY, APRIL 12, 1870.

The Council respectfully report the following resolutions for adoption at the regular monthly meeting of this Society, to wit:

*Resolved*, That it is eminently desirable that an expedition should be fitted out by the government for Arctic exploration and the discovery of the north pole.

*Resolved*, That in view of the great perils and difficulties which attend any attempt to penetrate the Arctic region in the vicinity of the Pole, and of the fact that the objects to be attained are scientific; the expedition should be commanded by an able officer of Arctic experience, having under him an efficient corps, so that an amount of scientific information may at least be gathered, which will reflect honor upon the country and justify the fitting out of the expedition.

*Resolved*, That without assuming to determine to whom the command of such an expedition should be entrusted, we would call attention to the fact that Dr. Hayes has not only the approbation of the American Geographical and Statistical Society, but has also received the gold medals of the Royal Geographical Society of London and the Imperial Geographical Society of Paris; the indorsements of the Imperial Geographical Society of St. Petersburg, the Geographical Society of Berlin, the Royal Academy of Sciences of Brussels, the Geographical Society of Italy; and having in his last expedition, though provided with very insufficient means, reached nearer to the pole than any previous explorer except Parry; he is, in the opinion of this Society, to be regarded as the most able, eminent, and experienced of living American Arctic explorers.

*Resolved*, That copies of these resolutions be forwarded to both houses of Congress and to the President of the United States.

Respectfully submitted.

F. A. CONKLING,

*Chairman.*

On motion, the meeting then adjourned.

Regular monthly meeting of the American Geographical and Statistical Society, Cooper Institute, New York.

May 10, 1870. Chief Justice CHAS. P. DALY, the president, in the chair.

The minutes of the last meeting, April 12, 1870, were read and approved.

The Council reported the following candidates for membership, as having been approved for election as

*Resident Members*—Henry G. Norton, Lucius Tuckerman, Richard S. Willis, Edwin Booth, Joseph Seligman, Jesse Seligman, James Seligman, Mayer Putzel, Marcus Goldman, S. G. Ward, Edward F. Davison, T. W. Ward, Samuel M. Schafer, Simon Schafer, Frederick R. James, Alfred G. Myers, R. Duncan Harris, Edwin W. Stoughton, Gen. Thomas A. Davies, F. F. Marbury, Capt. Chas. W. Raymond, U. S. A., Simon Stevens, William H. Neilson, E. Kellogg Wright ;

And by Chief Justice Chas. P. Daly, as

*Corresponding Members*—E. H. Perkins, U. S. Consul, St. Croix, W. I.; Henry Stevens, Esq., London, England; Prof. T. Sterry Hunt, LL.D., F. R. S., of Montreal, Canada; Dr. Robert von Schlagintweit, Professor of the Royal University of Giessen; George Gibbs, Esq., Washington, D. C. By Dr. G. Naphegyi—The Hon. Don Sabastian Lerdo de Tejada, Minister of State of the Republic of Mexico.

No ballot being called for, they were declared duly elected members of the Society.

The treasurer reported a cash balance in the treasury of \$767.93.

The librarian's monthly report was read by the recording secretary, and showed that four hundred and seventeen additions were made to the library, by purchase and donation.

On motion, both reports were accepted and ordered to be placed on file.

The recording secretary then read the following letters; which had been addressed to him, one by Mr. C. Maunoir, general secretary, and the other by Mr. V. A. Malte Brun,



honorary secretary, of the Imperial Geographical Society of Paris, accompanying the silver medal, which that society had awarded to Mr. Paul B. Du Chaillu, for his journeys into Ashango land.

Thereupon the president, turning to Mr. Paul B. Du Chaillu, presented to him the medal, with an appropriate address; in which he assured Mr. Du Chaillu of the gratification felt by this Society, that his valuable services in the cause of science, were recognized by a sister society of such high standing.

Mr. Du Chaillu accepted the medal, and thanked the Society for the sympathy and interest it had expressed in his behalf, when the veracity and exactness of his statements were questioned. All these doubts are now set at rest.

The president then introduced to the Society the Rev. Albert Bushnell, who has been a missionary for the past twenty-five years at the Gaboon, and who read a paper "On the Equatorial Regions of Western Africa."

On motion of the Rev. Dr. Thompson, the thanks of the Society were presented to Rev. Mr. Bushnell for his highly interesting and valuable paper, and a copy of it was requested for publication in the Journal.

Col. T. Bailey Myers then presented to the Society a manuscript map of the West Indies, copied by the unfortunate Gen. Goicuria (lately executed at Havana), while a prisoner in Spain after the Lopez expedition, from the original in the Escorial in Madrid — the original bearing the date of 1594.

On motion, the meeting then adjourned.

*Translation of a letter from C. Maunoir, general secretary, to E. R. Straznicky, recording secretary.*

GEOGRAPHICAL SOCIETY'S ROOMS, PARIS, }  
RUE CHRISTINE, March 9, 1870. }

MONSIEUR LE SECRETAIRE.—In conformity with the desire which you have manifested to the honorary secretary, Mr. Malte

Brun, I have now the honor to transmit to you the medal, which the Geographical Society of Paris has awarded to Monsieur Paul B. Du Chaillu, and would feel obliged if you would acknowledge the receipt of it.

The United States legation has graciously charged itself with forwarding this medal to you, and I hope that it will arrive in good season.

I seize this opportunity, Monsieur le Secrétaire, to assure you of the sentiments of my most distinguished consideration.

C. MAUNOIR,  
*General Secretary.*

*Translation of a letter from V. A. Malte Brun, secretary, to  
E. R. Straznicky, recording secretary in New York.*

PARIS, April 28, 1870.

MY DEAR SIR AND HONORED CONFRERE.—I thank you very cordially for the transmission of the American papers which contained an account of meetings of your Society. I have perused them, and made extracts which will appear in the *Annales des Voyages*.

I also received, two days ago, the second part of your Journal, Volume II, which had been addressed to the Geographical Society of Paris. I will announce it and speak of its contents in one of the numbers of the *Annales des Voyages*.

You must have received by this time, through the intervention of the United States legation at Paris, the silver medal for Mr. Du Chaillu. I hope you have been able to present it to him.

The question of the canalization of the Isthmus of Darien, by a Franco-American company, is worthy of all our attention; and since the American government is willing to occupy itself with this question, and even to send an expedition there, I have no doubt that good results may be obtained.

I send you herewith the March number of the *Annales des Voyages*, in which I have published the proceedings of the Geographical Society of New York on that subject. I regret, however, that the postal regulations do not afford more facilities for scientific intercourse. I mean free transmission.

I shall be very much obliged to you, and thank you a thousand times, for the transmission of the French paper of New York, if

it contains any geographical news or other articles of interest. I shall peruse it with great pleasure.

And Dr. Hayes, does he not think to retrace his steps toward the North Pole? With his practical experience, I have no doubt that he will arrive at a good result if he undertakes a third voyage.

Here the expedition of Lambert to the North Pole is still kept back *for lack of money*. I hope, however, that he will be able to leave in eight months. The *Germania*, of the German expedition, was obliged to take up winter quarters on the coast of Greenland, but we are still without information as to its results. The North Pole—the expedition of Sir Samuel Baker to the Equatorial lakes—the Sources of the Nile—and David Livingstone—these are the principal points which now interest geographers in Europe.

Please accept, my dear, honored confrere, the sentiments of my most distinguished consideration, and I beg you, at the same time, to present my respectful compliments to the honorable president of your learned Society, Chas. P. Daly.

Your most faithful confrere,

V. A. MALTE BRUN,

16 *Rue Jacob*.

Special meeting of the American Geographical and Statistical Society, Cooper Institute, New York, May 24, 1870. Chief Justice CHAS. P. DALY, the president, in the chair.

The reading of the minutes of the last meeting, May 10, 1870, was postponed.

The Council reported the following candidates for membership, as having been approved for election, as

*Resident Members*—William A. Conklin, Henry E. Stoughton, Wm. R. Martin, Nicholas Tiedeman, Edward P. Slevin.

No ballot being called for, they were declared duly elected members of the Society.

The president then introduced to the Society Dr. Ros-siter W. Raymond, United States commissioner of mining

statistics, who read a paper "On the Canons of the Snake and Columbia Rivers."

On motion of the Hon. A. B. Conger, seconded by Mr. Conkling, the thanks of the Society were presented to Dr. Raymond for his valuable and interesting paper, and a copy of it requested for publication in the Journal.

On motion, the meeting then adjourned.

Regular monthly meeting of the American Geographical and Statistical Society, Cooper Institute, New York, June 14, 1870. Chief Justice CHAS. P. DALY, the president, in the chair.

The minutes of the two previous meetings, May 10 and May 24, were read and approved.

Mr. Harris, on behalf of the Council, reported the following candidates for membership, as having been approved for election, as

*Resident Members* — Prof. W. Wright Hawkes, D. Colden Murray, Brevet Maj.-Gen. J. G. Barnard, U. S. A., Brevet Maj.-Gen. Albert J. Myer, U. S. A., Theodore Weston, C. E., Jno. B. Dash, James Thomson and Julius Hess.

No ballot being called for, they were declared duly elected members of the Society.

Mr. Remsen, on behalf of the treasurer, Mr. Henry Clews, reported a cash balance in the treasury, of \$687.

The librarian's report, in the absence of the librarian, Mr. H. B. Hammond, was read by the recording secretary, showing that in all, one hundred and fifty-four accessions were made to the library by purchase and donation, and that the exchange of publications with foreign scientific societies has been re-established.

On motion, both reports were accepted and ordered to be placed on file.

The president then called the attention of the Society to the last number of the Bulletin of the Italian Geographical Society in Florence, which had been presented to this

Society along with other foreign publications. It exhibits in a remarkable degree the extraordinary energy and activity of this eminently, useful Society; which, after a few years of existence, numbers now, already 1,143 active members.

The president then introduced to the society Dr. A. K. Gardner, who read a paper "On the Geographical Distribution of Disease."

After the conclusion of the paper, and on motion of the Hon. Chas. P. Kirkland, seconded by Mr. Harris, the thanks of the Society were presented to Dr. Gardner for his very interesting and instructive paper, and a copy of it requested for the archives of the Society.

On motion, the meeting then adjourned.

Regular monthly meeting of the American Geographical and Statistical Society, Cooper Institute, New York, November 15, 1870. Chief Justice CHAS. P. DALY, the president, in the chair.

The minutes of the last meeting, June 14, 1870, were read and approved.

Mr. Ward, on behalf of the Council, reported the following candidates for membership, as having been approved for election, as

*Resident Members*—C. B. Stoughton, Chas. McMillan, M. D.; Edward S. Dunster, M.D.; Edward H. R. Lyman, Chas. G. Havens, Chas. J. Stewart and George W. Abbe.;

And by Chief Justice Chas. P. Daly, as

*Corresponding Members*—Mr. Vojta Naprstek, of Prague, Austria; Senor Don Ignacio Mariscal, minister plenipotentiary from the Republic of Mexico to the United States; Senor Don Leopoldo Rio de la Loza, president of the Geographical and Statistical Society of Mexico; Senor Don Manuel Payno, vice-president of the Mexican Geographical and Statistical Society; Senor Don Ignacio Altamirano, member of the Mexican congress;

And by Prof. A. S. Bickmore, as a  
*Corresponding Member*—Prof. Cleveland Abbe, director  
of the Cincinnati Observatory.

No ballot being called for, they were respectively  
declared duly elected resident and corresponding mem-  
bers of the Society.

Mr. Remsen, on behalf of the treasurer, Mr. Henry  
Clews, reported a cash balance in the treasury of \$143.35.

The librarian's report was read, showing that since the  
last monthly report was presented, four hundred and  
thirty-seven accessions were made to the library, by pur-  
chase and donation.

On motion, both reports were accepted and ordered to  
be placed on file.

The recording secretary reported to have received a  
large number of foreign letters, and among these one  
from Cavaliere Cristoforo Negri, president of the Italian  
Geographical Society, accompanying four diplomas, as  
honorary members, for the Hon. Chas. P. Daly, Mr.  
Henry Grinnell, Mr. Jno. C. Fremont and Dr. I. I. Hayes.

The president then remarked, that he regretted that,  
except himself, none of these gentlemen were present to  
receive these marks of high honor from a sister society.

On motion, the recording secretary was instructed to  
communicate with the above-named gentlemen.

The president then introduced, to the Society, Simon  
Stevens, Esq., who read a paper "On the Isthmus of  
Tehuantepec as a New Route of Commerce."

After the conclusion of the reading of this interesting  
paper, on motion of Mr. James W. Gerard, seconded by  
Mr. Kirkland, the thanks of the Society were presented to  
Mr. Stevens, and a copy of it requested for publication  
in the Journal.

On motion, the meeting then adjourned.

Regular monthly meeting of the American Geographical  
and Statistical Society, Cooper Institute, New York.

December 20, 1870. Hon. F. A. CONKLING, one of the vice-presidents, in the chair.

The minutes of the last meeting, November 15, 1870, were read and approved.

Mr. Moore, on behalf of the Council, reported the following candidates for membership, as having been approved for election : Jno. A. Rutherford and Edward D. Miles.

No ballot being called for, on motion, they were declared duly elected resident members of the Society.

Mr. Remsen, on behalf of Mr. Henry Clews, read the treasurer's report, exhibiting a cash balance of \$265.13.

The recording secretary, on behalf of Mr. H. B. Hammond, read the librarian's report, showing that during the past month sixty-one additions were made to the library.

On motion, both reports were accepted and ordered to be placed on file.

On motion of Mr. Remsen, it was

*Resolved*, That a special committee of three members be appointed by the chair, to prepare nominations for the election of officers for the ensuing year, at the next annual meeting in January, 1871.

The president appointed Messrs. Henry E. Davies, Charles P. Kirkland and Cassius Darling as such committee.

The president then called the attention of the Society to a native map of the harbor of Yokohama, in Japan, which had been presented to the Society by Commander W. W. Maclay, U. S. N., through Dr. Archibald Maclay.

On motion, the thanks of the Society were presented to Commander Maclay for this interesting and valuable addition to the collection of maps.

The president then introduced to the Society Miner K. Kellogg, Esq., of Washington, D. C., who read a paper "On the Geography of Mount Sinai."

On motion of Rev. Dr. S. I. Prime, seconded by Mr. Kirkland, the thanks of the Society were presented to Mr. Kellogg for his very interesting and valuable paper, and a copy of it requested for publication in the Journal.

On motion, the meeting then adjourned.

E. R. STRAZNICKY,  
*Recording Secretary.*



TRANSACTIONS OF THE SOCIETY FOR 1871.

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Annual meeting of the American Geographical and Statistical Society, Cooper Institute, New York, January 31, 1871. Chief Justice CHAS. P. DALY, the president, in the chair.

The minutes of the last meeting, December 20, 1870, were read and approved.

Mr. Conkling, as Chairman of the Council, read the annual report for 1870, which, on motion, was accepted and placed on file.

Mr. Conkling, on behalf of Council, reported the following candidates as having been approved for election as

*Resident Members* — Laurens J. David, Wallace P. Groom, H. A. Jackson, Horace B. Fry, Frank E. Howe and Wm. M. Fliess.

No ballot being called for, on motion these gentlemen were declared duly elected members of the Society.

The treasurer, Henry Clews, Esq., presented his annual report for the year 1870, exhibiting a cash balance in the treasury of \$169.52.

On motion, the report was accepted and ordered to be placed on file.

The librarian, H. B. Hammond, Esq., not being able to attend, presented his annual report through Mr. Geo. Cabot Ward, showing that, in all, one thousand two hundred and twenty-three accessions were made to the library by purchase and donation.

On motion, the report was accepted and ordered to be placed on file.

Mr. N. M. Beckwith, in the absence of the chairman of the nominating committee, Judge Davies, presented

their report, recommending the following gentlemen to be elected as officers of the Society for the year 1871 :

*President*—CHARLES P. DALY, LL.D.

*Vice-Presidents*—HENRY GRINNELL, F. A. CONKLING, JOSEPH R. THOMPSON, D. D.

*Foreign Corresponding Secretary*—TOWNSEND HARRIS.

*Domestic Corresponding Secretary*—W. H. H. MOORE.

*Recording Secretary*—E. R. STRAZNICKY, M. D. Ph. D.

*Treasurer*—HENRY CLEWS.

*Librarian*—H. B. HAMMOND.

*Council*—WILLIAM REMSEN, T. BAILEY MYERS, THEO. W. DWIGHT, LL.D.; W. T. BLODGETT, W. E. CURTIS, GEO. W. CULLUM, U. S. A.; L. M. RUTHERFURD, GEO. CABOT WARD.

The president then appointed Messrs. Richards and O'Reilly as tellers, to proceed with the election after the conclusion of the annual address.

Chief Justice Daly then introduced to the Society Prof. D. C. Gilman, of the Sheffield Scientific School, Yale College, who delivered the annual address, selecting for his subject "The Last Ten Years of Geographical Work in this Country."

After the conclusion of this highly interesting and instructive discourse, and on motion of Prof. Dwight, seconded by Mr. Cooper, the thanks of the Society were presented to Prof. Gilman, and a copy requested for publication in the Journal.

The election of officers was now proceeded with, and the report of Messrs. Richards and O'Reilly showed that the gentlemen recommended on the ticket were unanimously elected, and on motion they were declared duly elected officers of the Society for the year 1871.

On motion, the meeting then adjourned.

E. R. STRAZNICKY,

*Recording Secretary.*

## ANNUAL REPORT OF THE COUNCIL FOR THE YEAR 1870.

ROOMS OF THE AMERICAN GEOGRAPHICAL AND  
STATISTICAL SOCIETY, COOPER INSTITUTE,  
NEW YORK, *January 31, 1871.*

Agreeably to the provisions of section three, chapter six, of the by-laws of the Society, the Council have the honor to present the following "general report of their proceedings and of those of the Society during the past year." In doing so, they have the satisfaction again to congratulate their associates upon the continued increase of the number of members; upon a large and valuable addition to the library and to the collection of atlases, maps and charts, among which may be mentioned the publications of our own and of foreign governments, and of our sister societies at home and abroad; and also upon the flattering marks of consideration with which the resumption of its active labors has been greeted by its numerous correspondents, including the leading scientific bodies, as well as many of the most distinguished savans of the old world.

At no former period has the library and map-room been so largely consulted by the members of the Society and by the public, who have been permitted on all suitable occasions to avail themselves of its benefits. In view of the general interest awakened by the announcement by several of the papers of this course, it has been a subject of regret that the limited space in the lecture-room has made it necessary to restrict the admission, at such times, to the members of the Society, to the representatives of the newspaper press and to a very small number of invited guests. With this exception, the five beautiful and spacious apartments which have been set apart for our accommodation, by the generous founder and the board of trustees of the Cooper Union, have afforded to all desiring to use them facilities unsurpassed in the country for the study of geography and statistics.

The Council avail themselves of this opportunity publicly to return their thanks to Messrs. Weed, Parsons & Co., the printers to the State of New York, for the donation of important public documents, which enabled us promptly to complete the parcels to be transmitted to our several correspondents, in exchange for their own publications and those of their respective governments.

Early in the last fiscal year it became necessary to decide whether the funds in the treasury should be applied to the preparation of a catalogue of the library, maps, etc., or to the publication of the Journal and the Society's Transactions. After mature deliberation, the latter of these alternatives was adopted. In making this decision, the Council was chiefly influenced by the fact that the classification and arrangement of the books, maps, etc., have been so thoroughly carried out under the direction of the recording secretary, Dr. E. R. Straznicky, as to render it comparatively easy to refer, without the aid of a catalogue, to any work in the possession of the Society.

The following summary exhibits the increase in the number of members during the year 1870:

Number of members in January, 1870.....	468
Number of members since added .....	93
Total.....	561
Number to be deducted by death and resignation.....	21
Number remaining January 31, 1871 .....	540
Net increase during the year.....	72

The finances of the Society continue to be in a satisfactory condition, as will appear from the subjoined abstract of the report of the treasurer, Henry Clews, Esq.:

Balance on hand, as per last annual report.....	\$574 44
Receipts to date.....	3,262 50
Total.....	\$3,836 94
Expenditures since January 25, 1870 .....	3,667 42
Leaving a cash balance on hand of.....	\$169 52
The estimate of receipts for the ensuing year is as follows :	
Dues of 463 resident members, at five dollars each...	2,315 00
Uncollected dues for 1870, about.....	200 00
Making the available resources for the year 1871.	\$2,684 52

No estimate has been made of the amount of the initiation fees of new members; but it is reasonable to assume that the receipts from this source will reach as large a sum as in former years.

The following abstract of the report of the librarian, H. B. Hammond, Esq., shows the additions made during the year to the library:

Number of books and maps added by donation.....	1,049
Number of books and maps added by purchase.....	174
Total addition by donation and purchase .....	<u>1,223</u>

Since the date of the last annual report, nine meetings of the Society and ten meetings of the Council have been held.

On January 25, 1870, the Society held its annual meeting and the present board of officers was elected. The Hon. Chas. P. Daly, the president, delivered the annual address, of which the recent explorations and theories for reaching the north pole formed the leading topic.

On February 15, the Hon. E. G. Squier read a paper "On the Geography and Ancient Monuments of Peru."

On March 22, Samuel P. Dinsmore, Esq., read a paper on the subject of constructing a canal across the Isthmus of Panama.

On April 12, Capt. Chas. W. Raymond, of the United States corps of engineers, read a paper on the Yukoa river region of Alaska.

On May 10, the Rev. Albert Bushnell, a missionary for the last twenty-five years at the Gaboon, read a paper "On the Western Regions of Equatorial Africa."

On May 24, Dr. Rossiter W. Raymond, United States commissioner of mining statistics, read a paper "On the Canons of the Snake and Columbia Rivers."

On June 14, Dr. A. K. Gardner, of New York, read a paper "On the Geographical Distribution of Disease."

On November 15, Simon Stevens, Esq., read a paper "On the Isthmus of Tehuantepec as a New Route of Commerce."

On December 20, Miner K. Kellogg, Esq., read a paper "On the Geography of Mount Sinai."

The long interrupted system of exchanges with foreign societies

was re-established during the summer by the transmission of packages containing the last number of the Society's Journal and various public documents of a scientific character.

Finally, the Council have much pleasure in commending the courtesy and fidelity with which the clerk, Mr. Robert Curren, has uniformly discharged his duties.

All of which is respectfully submitted.

F. A. CONKLING,

*Chairman.*

#### ANNUAL REPORT OF THE TREASURER FOR 1870.

ROOMS OF THE AMERICAN GEOGRAPHICAL AND  
STATISTICAL SOCIETY, COOPER INSTITUTE,  
NEW YORK, *January 31, 1871.*

The treasurer respectfully submits the following report for the period from January 25, 1870, to January 31, 1871, of the receipts and expenditures of this Society:

<i>Receipts.</i>	
Balance from last year .....	\$574 44
One life membership .....	\$50 00
Balance for one life membership .....	40 00
Initiation fees from new members .....	850 00
Annual dues for 1867 .....	10 00
Annual dues for 1868 .....	15 00
Annual dues for 1869 .....	45 00
Annual dues for 1870 .....	1,702 50
Additional subscriptions from—	
Messrs. Abner L. Ely .....	50 00
Anson G. P. Dodge .....	50 00
Wm. B. Ogden .....	50 00
J. Carson Brevoort .....	100 00
Paul B. Du Chaillu .....	50 00
From loan .....	250 00
	<hr/>
	3,262 50
Total (carried forward) .....	\$3,836 94

Brought forward.....	\$3,836 94
<i>Expenditures.</i>	
Salaries .....	\$804 00
Furniture .....	71 25
Stationery (including envelopes of meetings).....	103 00
Books.....	607 17
Printing (including Journal) .....	779 20
Sundries (including postage, advertising and postage stamps for meetings).....	972 93
Gas and steam .....	200 00
Map making.....	62 00
Binding of books.....	67 25
	<hr/>
	3,667 42
Leaving a balance on hand of.....	\$169 52
To this sum must be added the uncollected dues from 463 resident members for the coming year, at five dollars each, exclusive of life members.....	2,315 00
Outstanding dues for 1870, about.....	200 00
	<hr/>
Available resources for the coming year.....	<u>\$2,684 62</u>

In this sum are not included the initiation fees from prospective new members, which probably will amount again to several hundred dollars

HENRY CLEWS,  
*Treasurer.*

#### ANNUAL REPORT OF THE LIBRARIAN FOR THE YEAR 1870.

ROOMS OF THE AMERICAN GEOGRAPHICAL AND  
STATISTICAL SOCIETY, COOPER INSTITUTE,  
NEW YORK, *January 31, 1871.*

The librarian respectfully presents to the members of this Society the following report for the period commencing with the 25th of January, 1870, and ending on the 31st day of January, 1871:

The receipt books of this Society, in which are noted the several donations that are made to the library, show that during

the period mentioned five hundred and fifty-six donations have been made, and of the following character:

Folios .....	4
Quartos .....	54
Octavos .....	91
Duodecimos .....	9
Pamphlets—Quartos .....	81
“ Octavos .....	744
Maps .....	66
Total .....	1,049

The books of the Society in which are noted the various purchases which are made for the Society, show that one hundred and thirty entries have been made, and which comprise the following:

Folios .....	7
Quartos .....	22
Octavos .....	110
Duodecimos .....	11
Pamphlets—Quartos .....	7
“ Octavos .....	11
Maps .....	6
	174
Grand Total by purchase and donation .....	1,223

It will thus be observed that a large addition has again been made to the valuable and useful library of the Society during the past year.

The donations have been unusually large, and for the most part have been from foreign Societies with which this one is now again in regular correspondence and exchange. Among the other donors to this Society are included a large number of our national, State and municipal officers, and many private gentlemen, whose names will appear in alphabetical order in the printed Report.

The librarian cannot but congratulate the Society upon the very satisfactory condition of its library. It is to be regretted



that our funds have not permitted it to furnish the much-desired catalogue.

Respectfully submitted.

HENRY B. HAMMOND,

*Librarian.*

ROOMS OF THE AMERICAN GEOGRAPHICAL AND  
STATISTICAL SOCIETY, COOPER INSTITUTE, }  
NEW YORK, January 16, 1871.

The undersigned special committee, appointed at the last monthly meeting of this Society on the 20th December, 1870, for the purpose of preparing nominations for the election of officers on the 31st of January, 1871, respectfully report that they would recommend the names of the following gentlemen to be elected as officers of the Society for the year 1871:

*President*—CHARLES P. DALY, LL.D.

*Vice-Presidents*—HENRY GRINNELL, F. A. CONKLING, JOS. P. THOMPSON, D. D.

*Foreign Corresponding Secretary*—TOWNSEND HARRIS.

*Domestic Corresponding Secretary*—W. H. H. MOORE.

*Recording Secretary*—E. R. STRAZNICKY, M. D., Ph. D.

*Treasurer*—HENRY CLEWS.

*Librarian*—HENRY B. HAMMOND.

*Council*—WM. REMSEN, T. BAILEY MYERS, THEO. W. DWIGHT, LL.D., LEWIS M. RUTHERFURD, WM. T. BLODGETT, WM. E. CURTIS, GEO. W. CULLUM, U. S. A., GEO. CABOT WARD.

Respectfully submitted.

HENRY E. DAVIES.

CHARLES P. KIRKLAND.

C. DARLING.

Regular monthly meeting of the American Geographical and Statistical Society, Cooper Institute, New York, February 28, 1871. Chief Justice CHAS. P. DALY, the president, in the chair.

The minutes of the last annual meeting of January 31, 1871, were read and approved.

Mr. Ward, on behalf of Council, reported the names

of the following candidates as having been approved for election as

*Resident Members*—W. C. Cooper, Gen. Alexander Shaler, James A. McCreary, Rev. Wm. Wallace Atterbury, Wm. C. Gilman, Benjamin F. Butler, Douglas Robinson, Walter R. T. Jones, Henry J. Youngs, Wm. H. Swan, Howard Potter, Alfred Youngs, Robert S. Letson, Clifford A. Hand, James F. Cox ;

And by Prof. C. F. Hartt, of Cornell University, Ithaca, as

*Corresponding Members*—Senor Ferreira Penna, Para, Brazil ; and Dr. Joaquim Xavier De Oliveira Pimentel Santarem, Para, Brazil.

The ballot being called for, on motion, they were declared duly elected resident and corresponding members of this Society.

Mr. Remsen, on behalf of the treasurer, Mr. Henry Clews, presented his monthly report, exhibiting a cash balance in the treasury of \$697.74.

The recording secretary, in the absence of Mr. Hammond, the librarian, presented his report, showing that in all three hundred and sixty-nine additions had been made to the library by purchase and donation.

On motion, both reports were accepted and ordered to be placed on file.

Mr. Wm. E. Curtis offered the following resolution, which, after having been seconded, was unanimously adopted, to wit :

*Resolved*, That the thanks of the American Geographical and Statistical Society are tendered to the Hon. Fernando Wood, for the gift to the Society of one hundred and seventy-nine volumes of highly important, valuable and useful works.

The president then introduced to the audience Prof. Wm. H. Brewer, of the Sheffield Scientific School of Yale College, who delivered an exceedingly interesting and instructive discourse on his explorations in the Rocky Mountains, and the high peaks of Colorado.

The Rev. Dr. Joseph P. Thompson then arose and said :

MR. PRESIDENT.—I am sure that I but attempt to express, for I cannot hope fully to express, the pleasure which is shared by the entire Society, in rising to move a vote of thanks to Prof Brewer for his most striking and animating discourse, and to request that he would do us the favor, if he can spare time from his numerous occupations, to reduce it to writing, that we may use it through our channels of publication. I have been very much impressed, as I sat here this evening, with the richness and variety of resources opened to this Society on our own continent, which is our most legitimate field for investigation. If my memory serves me, this is the fifth or sixth address which we have had within the past year, or the past two years, upon different sections of our own North American continent. We have had the Pacific railroad, in particular. We had a section around the head waters of those rivers that have been pointed out and described. We have had Prof. Tillman's admirable digest of all the work done in our meeting during the past ten years. And yet, this especial matter has come before us to-night as vivid, as entertaining, as instructive, as though we had known nothing of it before. Indeed, for myself, I am indebted to the professor for a much more clear and satisfactory conception of that mountain region, of everything appertaining to it, of its elevation, extent, grandeur, natural history, even of its peculiar flavors, than ever before. [Laughter.] I have been struck, also, by the dignity and worth that science imparts to our humanity. As I was listening to this course of remark, my thought went backward to those ages which the geologists are just beginning to measure, when those mighty glaciers were formed, and did their work, and melted away; when the volcanoes poured forth their fires, and this lava, thousands upon thousands of feet in depth, was deposited.

Until this age of science, none of all that work of the Creator, none of all these processes of nature, had begun to be explored or comprehended. First, the wild man was there. We have no trace of his beginning, and he has left us few intelligible records of his life—nothing that we count as history. Then came the hunter, disputing with the Indian, as the Indian had disputed

before him with the buffalo and the bear, possession of this as a region from which to win the necessaries of life. Then came the adventurer and the emigrant, passing through these regions of grandeur, and seeking some place of settlement beyond. At last, comes the man of science, who plants his foot upon these highest peaks, measures these vast dimensions, maps out to us our country, acquaints us with the vast treasure the Creator has here deposited, near to us, and bids us go and possess it, with its untold treasures, for the use of humanity. All honor to science for the results presented before us to-night! Even if this relentless accuracy of measurement is a little toned down—though I think the lecturer contrived to sustain himself admirably at an average level of fourteen thousand feet [laughter]—nevertheless, he has given us room to spread upon the map in vastness of area. So I think we may take the comfort the American found in contradicting the Englishman, when he showed him the wonderful sights of Europe. The American's ready reply was that "America could beat that." Last of all, the Englishman took him up into the top of Vesuvius, and, looking into the crater, asked him, "Now, have you anything in America equal to that?" Said the Yankee, "We've got a water-spout over there that could squelch that in five minutes." So I think Switzerland is pretty effectually squelched out on that map. And, certainly, we are further indebted to these scientific investigations for the wealth of the country. I wish that not only the hundred friends gathered here this evening, but that many thousands of our merchants and financial men, might listen to such an address as this, might hear this story of deserted towns, abandoned cities. Wherefore? Because we have been so backward in sustaining our mining schools here in the east, and training the men who should go there and teach the miners to do something more than scratch the soil. These men who have been out there exploring have done more to-day to enrich New York, and all this eastern coast, than all the emigration that went out before them.

Most heartily, then, sir, do I make this motion, and I hope we shall be stimulated to explore, more and more thoroughly, this vast field opened to us, and invite the public to share with us the rich reward.

After Judge Davies had seconded the motion of thanks, and the request of a copy for publication in the Journal, the thanks of the Society were conveyed by the president to Prof. Brewer.

On motion, the meeting then adjourned.

Regular monthly meeting of the American Geographical and Statistical Society, Cooper Institute, New York, March 21, 1871. Chief Justice CHAS. P. DALY, the president, in the chair.

The minutes of the last meeting, February 28, 1871, were read and approved.

Mr. Moore, on behalf of the Council, reported the names of the following candidates as having been approved for election as

*Resident Members*—Robert Maclay, Constant Schnerr, Courtlandt Palmer, Jr., and Alexander J. Davis.

No ballot being called for, on motion, they were declared duly elected resident members of the Society.

Mr. Remsen, on behalf of the treasurer, Mr. Henry Clews, read his report, exhibiting a cash balance in the treasury of \$853.56.

The recording secretary, in the absence of the librarian, Mr. H. B. Hammond, read his report, showing that in all sixty accessions were made to the library by donation.

Both reports, on motion, were accepted and ordered to be placed on file.

The president then read the translation of a letter which had been addressed to him by the president and secretary of the Belgian Geographical Society, announcing the recent formation of that Society and asking sympathy and co-operation.

On motion, this letter was referred to the recording secretary for action.

The president also read two letters which had been addressed to him by Messrs. Henry O'Rielly and Alexander J. Davis, expressing sympathy and co-operation.

On motion, both these letters were accepted and ordered to be placed on file.

The president stated also the substance of a letter which had been addressed to him by a Senor Gorgoza, of Central America, claiming the priority of his discovery of a passage for a canal across the American isthmus.

On motion, the letter was accepted and ordered to be placed on file.

The president further stated that he had received a letter from the distinguished oriental traveler, Mr. Vambéry, in which he proposes to come to this country and to deliver a course of lectures on his travels in Central Asia.

On motion, the letter was referred to the recording secretary for future action.

The president then introduced to the Society Gen. James Grant Wilson, who read a paper "On the Northwest and its Discoveries."

At the conclusion of the paper, and on motion of Chancellor Ferris, seconded by Col. T. Bailey Myers, the thanks of the Society were presented to Gen. Wilson, for his interesting and valuable paper, and a copy of it requested for the archives of the Society.

On motion, the meeting then adjourned.

Regular monthly meeting of the American Geographical and Statistical Society, Cooper Institute, New York, April 18, 1871. Chief Justice CHAS. P. DALY, the president, in the chair.

The minutes of the last meeting, March 21, 1871, were read and approved.

Prof. Dwight, on behalf of Council, reported the names of the following candidates as having been approved for election as

*Resident Members*—Hon. A. Oakey Hall, Hon. Jos. F. Daly, Hon. Hamilton W. Robinson, Samuel A. Mitchell, and J. W. Drexel ;

And by Gen. James Grant Wilson, as  
*Corresponding Members*—Hon. Wm. Chambers, Edinburgh, Scotland;

And by Dr. Naphegyi—Senor Don Emilio Pardo, of Mexico, and Senor Don Jose Carlos, secretary of the Mexican commission on claims, at present at Washington, D. C.

No ballot being called for, on motion, these gentlemen were respectively declared duly elected resident and corresponding members of the Society.

The Council further respectfully recommended that Paul B. Du Chaillu, Esq., be elected an honorary secretary of this Society for the remainder of the present year.

On motion, the report was unanimously adopted, and the recording secretary instructed to notify Mr. Du Chaillu of his election as an honorary secretary.

Mr. Remsen, in the absence of the treasurer, Mr. Henry Clews, read the treasurer's monthly report, exhibiting a cash balance in the treasury of \$1,076.06.

The recording secretary read the librarian's report, showing that during the past month one hundred and eighty-seven accessions were made to the library by purchase and donation.

On motion, both reports were accepted, and ordered to be placed on file.

The president then mentioned that he had received a letter from our honorary secretary, Mr. Francis A. Stout, dated at Geneva, in Switzerland, in which he gives a very gratifying account of the high estimation in which our Society is held abroad, and says that he had purchased several scientific works, to be presented to the Society.

The recording secretary read the translation of the following letter, which he had received from Cavaliere Cristoforo Negri, president of the Italian Geographical Society in Florence, which, on motion, was ordered to be entered on the minutes.

The president stated that an act had passed the last

Legislature of New York, by which the name of the Society has been changed to "American Geographical Society," and that henceforth the Society's Journal will be printed by the State.

The president then introduced to the Society Hon. Wm. Gilpin, governor of Colorado, who read an essay on the territory of Colorado and the city of Denver.

On motion of Rev. Dr. Thompson, a vote of thanks was passed to Gov. Gilpin; and, on motion, the meeting then adjourned.

STATE OF NEW YORK, No. 237, IN SENATE, *March 7, 1871.*—Introduced by unanimous consent by Mr. Bradley; read twice, and referred to the Committee on Literature; reported favorably from said committee, and committed to the Committee of the Whole.

#### CHAP. 373.

AN ACT in relation to the American Geographical and Statistical Society.

PASSED April 8th, 1871.

*The People of the State of New York, represented in Senate and Assembly, do enact as follows :*

SECTION 1. The name or corporate title of the said Society shall hereafter be, "The American Geographical Society of New York."

§ 2. The objects of the said Society shall be the advancement of geographical science; the collection, classification and scientific arrangement of statistics, and their results; the encouragement of explorations for the more thorough knowledge of all parts of the North American continent, and other parts of the world which may be imperfectly known; the collection and diffusion of geographical, statistical and scientific knowledge, by lectures; printed publications or other means; the keeping up of a correspondence with scientific and learned societies in every part of the world, for the collection and diffusion



of information, and the interchange of books, charts, maps, public reports, documents and valuable publications; the permanent establishment in the city of New York of an institution in which shall be collected, classified and arranged, geographical and scientific works, voyages and travels, maps, charts, globes, instruments, documents, manuscripts, prints, engravings, or whatever else may be useful or necessary for supplying full, accurate and reliable information in respect to every part of the globe, or explanatory of its geography, physical and descriptive, and its geological history, giving its climatology, its productions, animal, vegetable and mineral; its exploration, navigation and commerce; having especial reference to that kind of information which should be collected, preserved, and be at all times accessible for public uses in a great maritime and commercial city.

§ 3. The power given by the act hereby accorded to the said Society to take, hold, convey, manage, and make use of its real and personal estate, shall be understood as authorizing said Society to take and hold, by gift, grant, bequest, devise, subject to all provisions of law relative to devises and bequests by last will and testament, or purchase real estate to the value of three hundred thousand dollars, and to invest its income, or its personal estate generally, so as to produce a regular annual income sufficient for the accomplishment of the purposes set forth in the first section of this act; but said annual income shall not exceed twenty-five thousand dollars annually.

§ 4. The said Society shall make an annual report of its proceedings to the Legislature.

## (TRANSLATION.)

*Letter of President Cristoforo Negri to E. R. Straznicky,  
Recording Secretary.*

FLORENCE, 24th March, 1871.

MY DEAR SIR.—Much business, hence a severe sickness, and thereafter a slow recovery, have prevented me to reply much sooner to your dear and esteemed letter of November 18, 1870, in which you give me so much pleasant information, and which I hope we will mutually continue to exchange.

You like to know the precise condition in which our Society finds itself at present. I must say that, after deducting all losses, there are to-day 1,246 effective paying members, of whom there are fifty life members.

It has no subvention from the government, nor from other institutions, or from the city. But the annual receipts from members come in now with sufficient regularity. It has three thousand lire in the treasury and two thousand lire accumulated as a fund, from contributions of life members. It has no debts, and will put to press the sixth volume of its Bulletin.

We shall continue to maintain in Abyssinia a naturalist, in the person of our member, Mr. Antinori. If the Italian government will establish a colony, as it has the appearance, then the Society will maintain there another naturalist, for the purpose of better exploring the country.

I insist that the government should unite one of their officers with the Arctic expedition, and it should in some way assist, also, the Antarctic expedition in 1874.

But the efforts which I made to give to the Society a strong internal organization, and to obtain efficient assistance in labor and in study, leave still much to be desired. Hence the presidency is weighed down with enormous cares.

Able men are not wanting in Italy, but harmony and perseverance in labors is difficult to accomplish.

I salute you from the bottom of my heart, and beg you to remember me respectfully to Messrs. Daly, Grinnell, Hayes, and all the other brave geographical members.

Your devoted

(Signed)

CRISTOFORO NEGRI.

Regular monthly meeting of the American Geographical Society, Cooper Institute, New York, May 16, 1871. Rev. Dr. Jos. P. THOMPSON, one of the vice-presidents, in the chair.

The minutes of the last meeting, April 18, 1871, were read and approved.

The Hon. Townsend Harris, on behalf of Council, reported the names of the following candidates, as having been approved for election as a

*Resident Member*—Childs Lee Clarke;

And by the recording secretary, as

*Corresponding Members*—Gen. Vicente Riva Palazios, of Mexico; Senor Manuel Cierol, governor of Yucatan, Mexico; Senor Joaquin Baranda, governor of Campeche, Mexico.

No ballot being called for, on motion, these gentlemen were respectively declared duly elected resident and corresponding members of the Society.

In the absence of the treasurer, Mr. Moore read the treasurer's monthly report, exhibiting a cash balance of \$987.78.

The recording secretary read the librarian's monthly report, showing that during the past month fifty-one items were added to the library by donation.

On motion, these reports were accepted and ordered to be placed on file.

The president then read the translation of a very complimentary passage in the last annual address of the president of the Italian Geographical Society, Cavaliere Cristoforo Negri.

On motion, the recording secretary was instructed to express the thanks of this Society to our sister Society in Italy, for this manifestation of kindness and good wishes.

The president then introduced to the Society Prof. Chas. Frederick Hartt, of Cornell University, who delivered a discourse on his recent explorations of the Amazonas.

On motion of Prof. B. N. Martin, seconded by Mr.

Morris, the thanks of the Society were then presented to Prof. Hartt for his very entertaining and instructive discourse, and a copy requested for publication in the Journal.

On motion, the meeting then adjourned.

Regular monthly meeting of the American Geographical Society, Cooper Institute, New York, June 13, 1871. Chief Justice CHAS. P. DALY, the president, in the chair.

The minutes of the last meeting, May 16, 1871, were read and approved.

Gen. Cullum, on behalf of Council, reported the names of the following candidates as having been approved for election as

*Resident Members*—Richard Larramore, Alexander Hamilton, Jr., Octave Pavy and Ambrose Lee.

No ballot being called for, on motion, these gentlemen were declared duly elected members of the Society.

Mr. Remsen, on behalf of Mr. Clews, read the treasurer's report, exhibiting a cash balance of \$890.01.

In the absence of the librarian, the recording secretary read his report, showing that during the past month forty-three items were added to the Society's library by purchase and donation.

On motion, these reports were accepted and ordered to be placed on file.

The recording secretary then read a letter addressed to him by Mr. F. A. Stout, by which he presents to the Society several very interesting relics of Capt. Ross, and a rare geographical work by Arnoldus Montanus.

On motion, the thanks of the Society were ordered to be presented to Mr. Stout for his valuable gift.

The president then announced to the Society the arrival in this city of Capt. Hall, with his ship, *The Polaris*, on his way to the arctic regions, and that a reception would be given at the Society's rooms to the captain and his officers before their departure for the north pole.

The president also introduced to the Society Mr. Octave Pavy, an American citizen of French descent, who was soon to start on his own account on an expedition to the north pole, by way of Siberia and Kamschatka.

The president also read the following letter, which had been addressed to him by Prof. Drisler, of Columbia College, accompanied by a portrait of the geographer, J. N. Reynolds.

On motion, the thanks of the Society were ordered to be presented to Prof. Drisler for his valuable donation.

The president then introduced to the Society Mr. Walton Grinnell, who read a paper on Eastern Manchouria, with observations on the manners and customs of the inhabitants of Corea.

On motion of Col. Myers, seconded by the Rev. Dr. Thompson, the thanks of the Society were presented to Mr. Grinnell for his highly instructive and interesting paper, and a copy of it requested for publication in the Journal.

On motion the meeting then adjourned.

NEW YORK, June 13, 1871.

JUDGE DALY, *President American Geographical Society* :

DEAR SIR.—Will you accept, for the American Geographical Society, the accompanying portrait of the geographer, J. N. Reynolds. You, of course, remember him as one actively engaged, some years ago, in this city, in politics and literature. His chief attention, apart from his political career, was devoted to the spread of geographical knowledge, and all his publications, so far as I know them (except a life of Washington, in Latin, said to have been written by his old schoolmaster, in the then backwoods of Ohio), had the same object in view. In 1835, he published, through Messrs. Harper & Brothers, a "Narrative of the Voyage of the United States Frigate Potomac, under the command of Commodore John Downes, during the Circumnavigation of the Globe in the years 1831, 1832, 1833 and 1834."

He also delivered an "Address on the Exploring Expedition to the Pacific and South Seas," which he printed in 1836.

It seems eminently fitting, then, that this portrait should be in the keeping of a Society whose primary object is to advance the science in which he took so hearty an interest.

Yours, very respectfully,

H. DRISLER.

Regular monthly meeting of the American Geographical Society, Cooper Institute, New York, November 28, 1871. Chief Justice CHAS. P. DALY, the president, in the chair.

The minutes of the last meeting, June 13, 1871, were read and approved.

Mr. Geo. Cabot Ward, on behalf of the Council, reported the names of the following gentlemen as having been approved for election as

*Resident Members* — Wentworth Huyshe, Wm. S. Mayo, M. D., Henry C. Bolton, Ph. D., Oliver Charlick, and Samuel Wilde, Jr., of Montclair, N. J.

No ballot being called for, on motion, these gentlemen were declared duly elected members of the Society.

Mr. Remsen, on behalf of the treasurer, read his report, exhibiting a cash balance in the treasury of \$328.16.

The recording secretary read the librarian's report, showing that, from the 13th of June to this date, three hundred and eighty-one accessions were made to the library of the Society, by purchase and donation.

On motion, both reports were accepted, and ordered to be placed on file.

The recording secretary also read a letter, addressed to him by Mr. Francis A. Stout, announcing a gift of a portion of the "Voyages" of De Bry, for which, on motion, the thanks of the Society were ordered to be expressed to Mr. Stout.

The president called attention to the loss which the Society had sustained in the death of two distinguished savans, namely, of Sir Roderick Impey Murchison, late president of the Royal Geographical Society of London,

and an honorary member of this Society; and of William Ritter von Haidinger, late ex-president of the Imperial Geographical Society of Vienna.

The president then, in returning to the death of Sir Roderick, said:

Since the last meeting of the Society, intelligence has been received of the death of Sir Roderick Murchison, the most distinguished name upon the roll of our honorary members. The time that must necessarily be devoted, this evening, to the examination and discussion of the Verrazano map and the paper which Mr. Brevoort has prepared, respecting it, will not admit of my saying as much as I would have wished upon a career so fruitful as that of our late illustrious associate. It will preclude my entering upon any detailed account of it, or speaking of it, except in a very cursory and general way.

The circumstances under which Sir Roderick devoted his life to advance the knowledge of mankind in the branches of science to which he especially applied himself, may be referred to as an instructive and most encouraging example. Men who become eminent in science are usually those who have, from the beginning, a strong natural aptitude for it; who are impelled, in that direction by the consciousness of their particular fitness for such inquiries, or, to express it more strongly, by the irresistible bent of their genius; whilst others, less fortunately endowed by nature, are attracted to such pursuits by the personal distinction acquired, if they attain to any eminence. This was not the case with Sir Roderick. His father, the representative of an ancient Scottish family, had served with distinction in India, at that eventful period when the conquest and subjugation of the greater part of it was achieved by Warren Hastings, and, as was very natural, he destined his eldest son for the profession of arms. Educated in a military college, Sir Roderick entered the army and served under the Duke of Wellington, in the memorable war of the Peninsula, with the reputation of a brave and able officer. He reached the rank of captain, and when the peace of Europe was restored, being married and possessed of a large fortune, he retired from the army to the enjoyment of the life of an English country gentle-

man ; which, in his case, was especially attractive, for he had social position, military rank, wealth, and a fondness for field sports and out-of-door amusements. It was what would be to the majority of men, and particularly to Englishmen, a most enviable position—one which few would care to give up for any special pursuit, unless it should be political distinction, toward the achievement of which it is both an aid and a temptation. A very slight circumstance—a fishing acquaintance with the author of *Salmonia*, Sir Humphrey Davy—led to a suggestion from that eminent man that Sir Roderick should turn his attention to science; and as the suggestion is said to have been supported and encouraged by his wife, he acted upon it, and became one of the most practical, energetic, industrious and logical of explorers in one of the most complicated and difficult of pursuits, the science of geology—which, at that time, was but slowly emerging from the chaotic state into which it had been brought by the long protracted struggle between the Neptunists and Vulcanists. Of his labors and achievements as a geologist, it would be more appropriate that some of the eminent geologists of the Society should speak; but I may venture to say, I think with their approval, that few men have done more than he did, in that science, to bring order out of confusion, to rescue geology from the dogmatic impediments of theorists, and to change the direction of it into that line of inquiry which has led to such a large accumulation of facts, and produced such marvelous results. I think that I have heard it said that he received his first instruction from Smith, the English surveyor, who, recognizing the laws of superposition of stratified rocks, that the order of succession of groups was never inverted, and that each could be identified and distinguished by its peculiar fossils, traversed the whole of England upon foot, and, unaided by previous explorers, and without the assistance of a single co-laborer, brought into their natural division the whole series of English rocks. Whether Smith was his instructor or not, he followed up the pathway opened by this remarkable man, for his fame was established by, and will chiefly rest upon, his exploration and exposition of that great system of rocks to which Sir Roderick gave the name of Silurian; covering a vast period of time in the physical history of the globe, and embracing, until



the recent Laurentian discoveries, the earliest evidences of organized life upon our globe — a work for which he may be said to have perfected himself by explorations in northern Italy, in southern France, in the eastern Alps, and in the highlands of Scotland.

Ten years after this we find him engaged in the geological survey of Russia, or, more correctly, the European part of it; a labor of several years, the results of which were given to the world in an elaborate work, published in the English and Russian languages, the publication of which was followed by distinctions conferred upon him alike in Russia and in England.

I regret to say that I am not fully acquainted with the extent of his labors or writings as a geographer. He has not, that I am aware of, written any geographical works; but as he was, during his long life, a contributor of papers to various journals, periodicals and scientific bodies, he may have written a great deal upon geographical subjects with which I am unacquainted. In that department he is known to me, chiefly, as the president of the Royal Geographical Society, as the one to whom that society is more indebted than to any other man for the distinguished position it now occupies; and my knowledge of him, as a geographer, is derived principally from what I have read of his views and observations, in the Transactions of that body of which he was so long the distinguished head. The impression left upon my mind is that he looked upon geography rather from the stand-point of a geologist, and was more interested in the exact structure, the form and the surface of the earth, than he was in the phenomena which makes up so large a part of physical geography; and is, in this respect, distinguishable from his cotemporary, Sir John Herschell, who was not only a great astronomer but also eminent as a physical geographer. Sir Roderick was enthusiastically devoted to the acquisition of a knowledge of the unexplored portions of the globe, and especially sympathized with, and aided to the utmost of his efforts, polar and African explorations. He appears to have formed a very accurate conception of the physical features of central Africa, of the general laws of its physical structure, and to have had an almost prophetic instinct of what would be disclosed by actual exploration, and, so far as it has been laid open by explorers, his antici-

pations seem to have been verified. In everything relating to Africa, his knowledge was extensive, full and accurate, and his views large and comprehensive. His unwillingness to give credit to the general belief in the death of Livingstone, arose from the fact that he could form a more accurate conception than others of the position of the traveler, and of the circumstances with which he would be naturally surrounded, and was, therefore, better able to weigh and estimate the value of the evidence upon which the belief in his death was founded.

But I have already extended my remarks beyond the limits proposed. I very much regret that, in consequence of the business before us, I cannot call upon some of the gentlemen present, to whom the Society would listen with great interest, to speak of Sir Roderick as a scientific man, and, especially, as a geologist; our time will not admit of it; and I will, therefore, close my remarks simply with the general observation that we are indebted to him, more than to any of his cotemporaries, for making geography a subject of general public interest, not only in England but in other countries; and that he will always be regarded as having given the impulse to the movement, now so general, for obtaining full and accurate information of every part of the planet we inhabit.

Prof. Dwight read the following letter, addressed by Rev. Dr. Joseph P. Thompson, lately one of our vice-presidents, to the recording secretary, resigning his office in the Society, on account of his contemplated sojourn in the East. Prof. Dwight submitted the following preamble and resolutions:

*Whereas*, The Rev. Dr. Joseph P. Thompson, lately one of our vice-presidents, has been for many years an honored and an eloquent officer of this Society, serving it with assiduous devotion and discriminating care; and

*Whereas*, This Society is deeply sensible of the profound loss it sustains through his withdrawal from its management and from its meetings; therefore,

*Resolved*, That Dr. Thompson be and hereby is appointed an honorary secretary of this Society during his absence from the United States; and that he be, and is, invited to act as its foreign

agent, to represent it and to transact all business of the Society with the governments, kindred bodies, and individuals with whom we may correspond—to the end that, availing ourselves of his learning, tact and zeal, we may find our exchanges enlarged, our collections increased, and our field of usefulness widened.

*Resolved*, That the recording secretary be instructed to transmit to Dr. Thompson a copy of these resolutions.

Which, on motion, were unanimously adopted.

The president also read the following letter, which had been addressed to him by Baron von Lutke, vice-president of the Imperial Russian Geographical Society of St. Petersburg, promising, on the part of the Imperial Russian government, all possible aid and assistance to Mr. Octave Pavy, who left here last summer on an expedition to the north pole by way of Siberia and Kamschatka.

The president then, in introducing Mr. J. Carson Brevoort to the Society, who had prepared a paper on a copy of the Verrazano map, lately obtained through the efforts of Thomas E. Davis, Esq., in Rome, read the following letter, which he had addressed to this gentleman :

*Letter of Chief Justice C. P. Daly to Mr. Thomas E. Davis,  
in Rome, Italy.*

AMERICAN GEOGRAPHICAL AND STATISTICAL SOCIETY, }  
NEW YORK, October 26, 1870. }

MY DEAR SIR.—You will doubtless be surprised at this letter from me, which will at least recall our former more intimate acquaintance, of which I retain very pleasant recollections. I wish to ask your good offices in aid of an historical geographical inquiry, now pending before the American Geographical and Statistical Society of this city, of which I have been for some years the president. It is to obtain a photographic copy of a map now in the museum of the Propaganda at Rome, the importance of which, in this country, you will appreciate when I state the reasons that make it so, and which have given rise to this request.

It has been supposed that the bay and harbor of New York were first discovered, and the whole of the coast of the United States, from North Carolina to Maine, explored, in 1524, by Giovanni Verrazano, a Florentine, then in the service of France. The fact rests almost solely upon a letter giving an account of this early voyage, which was printed by Ramusio, an Italian compiler of voyages, in the third volume of his collection, published in Venice in 1553. The letter purports to have been written by Verrazano to Francis I of France, by whom he was entrusted with the command of four vessels, to discover new lands. Through perils encountered in the outset, the command, according to this letter, was reduced to a single ship or caraval, with a crew of fifty men, with which Verrazano sailed westward from the island of Madeira, on the 17th of January, 1524, and after a voyage of forty-nine days, reached, in his own language, a new country, which had never before been seen by any one, which is supposed to have been the coast of North Carolina; that from thence he sailed along the coast, south, for about fifty leagues, but finding no harbor, turned about again and pursued his course along the coast, northerly, until he reached what is supposed to have been the bold shore of Maine and New Brunswick, when, his provisions and naval stores being exhausted, he returned to France, arriving at Dieppe, in Normandy, in the beginning of July, from whence his letter to Francis I purports to have been written, on the 8th of July, 1524, the voyage having consumed about seven months. The letter, which is a very long one, covering thirteen printed pages, gives a detailed account of the entire voyage, embracing a survey of seven hundred miles of coast, including nearly the whole of the United States and a large part of the British provinces, to which he gave the general name of New France.

During this expedition, he landed, according to his account, in seven different places, one of which is supposed to have been the entrance to the harbor of New York; another is recognized as an excellent description of Narraganset Bay and the harbor of Newport. He gives a very full account of all that he saw, the configuration of the coast, the nature of the harbors, the inhabitants of the country and its natural productions; the trees, plants, fruits, flowers; the wild animals, and the appearance,

dress, avocations and customs of the primitive people he met with.

The letter is quite interesting, and, if genuine, very valuable, as the earliest description of what is now the United States. No account of any such voyage, however, has been found in the records of the French marine; nor is there anything respecting Verrazano, except the fact that he was born in Florence about 1480, that he was of a noble family, and the supposition that he was one and the same person with Juan Florentin or Floren, a kind of buccaneer in the service of France, who was employed by Francis I to waylay the richly freighted Spanish merchantmen returning from America, a career in which he was very successful, having captured two vessels laden with the treasures of Montezuma, which he brought to France, but was himself afterward captured by four Biscayen vessels, brought to Cadiz, where he was tried as a pirate, convicted and afterward executed at El Pico, in New Castile, by the express order of Charles V, in 1527. The identity of these two men is argued from the circumstance that both were natives of Florence, both were named John; that the French records show only one Florentine, with the name of John, who was in the service of France at this period, as a commander of vessels; that both disappeared in the same year, 1527, nothing having been heard of Verrazano after Juan Florentin, or Florin, was executed as a pirate; and that Barcia, the Spanish historian of Florida, a very reliable author, who wrote in 1723, in describing the exploits, and subsequent execution, of this man, calls him Verrazano.

About a century ago, Tiraboschi, the Italian historian, called attention to the fact that the letter of Verrazano, published by Ramusio, existed in manuscript in the Strozzi library, in Florence. This document is now in the Magliabechian collection. It is written in Italian, but whether it is the original, or a copy, is uncertain, as it differs in some respects from the one published by Ramusio. A copy of this manuscript was obtained by our former Consul at Rome, George A. Greene, which was translated by Mr. Cogswell, of the Astor library; and the translation, with the original, was published by the New York Historical Society. Accompanying this document, in the Magliabechian collection, is another letter, purporting to have been written by Verrazano, from

Lyons, after he had seen the king. This letter is not free from suspicion, but, if genuine, the copy of Verrazano's letter, in it, may be the one now found in the Magliabechian collection.

The only remaining fact, of any value, concerning Verrazano's voyage and discoveries, is a copper globe, found in Spain, and now in the New York Historical Society. This globe, which, from an inscription upon it, was made in Venice, in 1542, eleven years before Ramusio's volume, containing Verrazano's letter, was published in that city, has Verrazano's discoveries marked upon it, with a rude, but, for the time, very fair, outline of the North American coast, together with this inscription: "Verrazano, sive Nova Gallia, a Verrazano, Florentino comperto, Anno sol M. D." I may add, that an inscription on the globe shows that it formerly belonged to, and was probably made for, Cardinal Marcello Cervino, afterward Pope Marcello II, a circumstance of some value, as that pope, when the globe was made, was Archbishop of Florence, the city in which Verrazano was born; and as his holiness was twenty-four years of age when this voyage is said to have been made, he may probably have known something of Verrazano and of his discoveries.

I have here given you, briefly, the evidence upon which this alleged voyage of discovery rests, and have now to add that the genuineness of the letter, containing the account of it, has been seriously questioned. Mr. Buckingham Smith, our former secretary of legation at Madrid, a gentleman distinguished for his literary and historical researches, has subjected it to a close critical examination, in a very able paper read before the New York Historical Society, in which he has pointed out grave mistakes in the description of the coast, the soundings, the tides, and the courses steered; three of which he finds to be wrong; mistakes which he thinks could not have been made by a seaman; and because grapes and other fruits are represented in the letter as found ripe, three months in advance of their natural season. At the same time he freely admits that the general character of the land and the vegetation could not have been so correctly described, except from actual information; and he thinks these errors are inventions, which were thrown in among observations found in some memoranda left by an actual observer. He also points out, as remarkable, that a navigator, following the coast closely,

sailing only by day and lying-to at night, should pass from North Carolina or Georgia to the vicinity of New York, crossing Chesapeake bay, without finding any harbor; and that he should have coasted to the British provinces, keeping close to the shore and never losing sight of it, without noticing the insular character of Nantucket, or the peculiar configuration of Cape Cod, etc. Mr. Greene, who examined the original document, thirty years ago, states that the character of the writing is of the sixteenth century; and Mr. Smith is of opinion, in explanation of its mistakes, that it was written at a period when the entrance to the coast and the lay of the land were imperfectly, if at all, known, and dated forward, so as to give it priority in the order of maritime discovery. Such things have been done, and Mr. Smith calls attention to some of the voyages attributed to Amerigo Vespucci, which are supposed to be fictitious, and to have arisen from the emulation, among Italian cities, to share in the honors of this great period of maritime discovery; and there is certainly some weight to be attached to the fact that no evidence of such a voyage has ever been found in France, and that the only original evidence of it is the letter found in the library at Florence, and upon a globe belonging to an archbishop of that city, the birthplace of the alleged discoverer. Other American geographers, on the contrary, are disposed to think that this voyage was actually made, and that the letter, notwithstanding the errors to be found in it, is genuine. The Hon. Henry C. Murphy, who has given great attention to our early discoveries, and who is among the best informed men upon the subject that we have in this country, is not, as I understand from Mr. Smith, satisfied that the letter is fabricated. For my own part, I am disposed to think it genuine upon the internal evidence of the letter itself, and the difficulty of fabricating it. But without going further into the evidence for or against it, the map in the museum of the Propaganda, a photographic copy of which we wish to get, is a piece of evidence which will probably settle the whole controversy. It is a map without date, on which is delineated the land discovered by Verrazano, and was made by his brother, Hieronimus Verrazano—at least such is the account I have received of it. An application, I understand, was made last year for a copy of this map, by the United States

consul, Pietro Calvi, Esq., to the superior of the Propaganda, Cardinal Baroddas, who admitted that the map was carefully preserved in the museum, but who refused to allow a copy of it to be taken; for what reason I do not know.

If this map is what it is alleged to be, it is perhaps the earliest delineation of the coast, harbors and territory of the United States; and, as such, is a document of great national interest to us. There may have been some special reason why Mr. Calvi's request was not complied with, for I can conceive of no general reason why permission to photograph such a document should be refused. The taking of a photograph could in no way injure the original, no matter what may be its condition, and there can certainly be nothing in such an instrument that would make it material to keep it from the public, as its whole value consists in the relation it bears to the history of geographical discovery. Great liberality has been shown by governments and institutions in allowing original maps to be photographed, to aid the study of geography and history. I have received from Italy, during the past year, the photograph of the atlas of Andrea Bianco, of 1436, consisting of ten maps and a photograph of Fra Mauri's celebrated map of the world of 1459, both of them documents of greater value than this map of Verrazano's brother.

A photographic copy is necessary, that it may be compared with the map of Roberto of 1529, and that our geographers, who are familiar with every part of our coast, may carefully examine, to judge whether it was probably drawn from actual observations or was simply conjectural, and if there is any gentleman in Rome who is skillful in determining the age of manuscripts, his opinion as to the period when this map was probably made would be very desirable. Sir Francis Madden, of the British Museum, could tell, from the inspection of a manuscript, about the period when it was written; and Mr. Major, of the same institution, could, upon examining a manuscript map, pronounce within a very few years of the time when it was produced. There may, probably, be some gentleman in Rome equally skillful, whose opinion as to the age of the Verrazano map, as it is without date, would greatly aid the inquiry. If the map is large, it may have to be photographed in parts. The countrymen of Columbus should feel an interest in our establishing the



fact that the first exploration and description of the United States were due to the efforts and adventurous spirit of an Italian; for if the claims of Verrazano are set aside, that distinction will have to be awarded to the Portuguese navigator, Estavan Gomez, who afterward explored the coast of the United States, while employed in the service of Spain.

It was first proposed that the Society should make its application for a copy of this map through the State Department at Washington; but Mr. Townsend Harris, who is a member of our Council, and the foreign corresponding secretary of the Society, suggested that you would probably, upon request, undertake to procure the photographic copy for us, and that you would probably know better than anybody else how the permission could be obtained; and I thought you would willingly aid us in an inquiry respecting the first discovery of a country in which you have so deep an interest and have passed so many years of your life. Whatever expenses are incurred will be paid by the Society, and you can draw upon me for the amount, which will be promptly remitted. This letter will be sent through Mr. Harris, who will also address you upon the subject. I send you a copy of my last annual address, the perusal of which may possibly interest you.

With my kindest regards to Mrs. Davis and your daughter, believe me, ever truly yours,

CHARLES P. DALY.

After the reading of the above letter, the president then said, that the late Mr. Buckingham Smith had, during the past ten years, made extensive inquiries in Spain and Portugal respecting Verrazano, which resulted in the discovery of manuscripts showing that Lusitanian authors, who wrote upon cotemporaneous events, speak of him as an intrepid sailor, who had been in India in 1517, assuming him to be one and the same person with Juan Florin. According to the statement of several eminent Italian scholars, he had lived for some years in Cairo, engaged in commercial pursuits, until the Mahometans cut off all communication, by the way of Syria, between Europe and Asia. Mr. Smith found that, in 1523, he was

about to undertake a voyage from France to Cathay, but was prevented by the intervention of the Portuguese government. This was the year previous to the voyage described in the letter of Verrazano, and which voyage he says was undertaken with the intention of reaching Cathay or China by the discovery of some passage in lands at the west, by which he could penetrate in that direction to the eastern ocean, and may have been undertaken because the Portuguese government would not allow him to sail to India by the way of the Cape of Good Hope. This fact, Mr. Smith admitted, opened the way for the belief that the voyage to America may have been made, as described in the letter in the Magliabechian collection, in the summer of the following year.

It appears that, in 1522, two years previously, he, Verrazano, was engaged in making depredations upon Spanish shipping, in the vicinity of the Canaries, and that in the following year, 1523, he captured two vessels, as has been stated, coming from the Azores, upon their passage from Mexico to Spain, laden with the treasures of Montezuma, and which he carried to France; an achievement which may have enabled him to return again to the sea, in the next year, 1524, with a well appointed fleet of four ships, as described in his letter, with the expectation of reaching India by the discovery of a passage around or through the continent of North America.

The ill-success of his attempt to find a way to India, in that direction, may have led to another expedition, by him, to reach India in the following year, 1524, the evidence of which was found in a document recently discovered by Mr. Margry, in the archives of the French marine, which is an agreement between Verrazano and certain officers of the French government and some eminent merchants of France, for the fitting out of an expedition, to be composed of three vessels, for a voyage to India for spices, but which was designed to be also of a predatory character, as provision is made in the contract

for the proportions in which the booty, if any were obtained, was to be distributed. This voyage was probably designed to be made by the way of the Cape of Good Hope ; but whether it was undertaken or not, or if it was, what was the result of it, is not known. The document, which is in French, sets forth that Verrazano was to be the pilot, that is, the commander of the expedition ; and, in the instrument, he is called Johan de Varesam, which is, no doubt, a French corruption of the real name, Giovanni Verrazano.

The further career of Verrazano is, as I have stated to Mr. Davis, involved in doubt. Barcia, in his work on Florida, after noticing the account of Verrazano's voyage to America, as found in Ramusio, says that, in the year 1524, after having been again greatly favored and honored, he went to sea again, with a stronger outfit than before, committing still greater ravages ; but that, on his return to France, having encountered five vessels belonging to Biscay, his ships were captured and sent to Sevilla, whence he and his captains were taken to Madrid, where they were tried, found guilty of piracy, and were hanged at Puerto del Pico ; whilst other writers give a different and less reliable account of his subsequent career and death.

Mr. Smith ascertained, from documents discovered by him in Spain, that the account of Barcia was substantially correct. He found that "Juan Florin" was, after trial, executed, with some of his followers, by the order of Charles V, at Colmenaz de Arenas, on the direct route from Cadiz to Lerma, about sixty miles south of west from Madrid.

Mr. Smith was cut off by an untimely death last winter, at the very period that he was about to prepare an account of his further researches respecting Verrazano, which he meant to print as supplementary to his previous publication ; and what I have now given in addition to my letter is from manuscript notes submitted by him to the inspec-

tion of Mr. Brevoort and myself. In his death we have lost the most accomplished American scholar, in all matters relating to the Spanish discoveries in America, who had represented our country as a diplomatist in Spain, in Portugal and in Mexico; and who, to his acquisitions as a scholar, and his indefatigable spirit of research, added the personal attraction of a refined and courteous gentleman.

After the conclusion of Mr. Brevoort's highly interesting and instructive paper, and on motion of the Hon. Henry C. Murphy, the thanks of the Society were presented to Mr. Brevoort, and a copy of his paper requested for publication in the Journal.

On motion, the meeting then adjourned.

(TRANSLATION.)

*Letter of Baron von Lutke to Chief Justice C. P. Daly.*

IMPERIAL RUSSIAN GEOGRAPHICAL SOCIETY, }  
ST. PETERSBURG, *September, 1871.* }

[1868.]

TO MONS. CHAS. P. DALY, *President of the American Geographical Society:*

MR. PRESIDENT.—It is with the liveliest interest that I have taken notice of the letter which you have had the kindness to address to me, dated New York, July 5. The letter arriving in St. Petersburg during my absence in the country, I can only answer it to-day, and beg you to accept my excuses for this involuntary delay.

The expedition of Mr. Octave Pavy deserves all the sympathies of the scientific world, and the Imperial Geographical Society of Russia hopes most sincerely that this traveler's bold enterprise may succeed.

I have placed myself in communication with the governor-general of eastern Siberia, for the purpose of informing him of the early arrival of the expedition at Petropaulosk, and I have requested him, in the name of the Geographical Society, to furnish aid and assistance to these Arctic explorers.

It must, however, be borne in mind that this protection can only be effected to a very limited extent, as, beyond Gijiguinsk and Nijne-Kolymsk, permanent establishments or settlements do not exist. The transportation of reports or letters, which Mr. Pavy might address to Europe and to America, will prove equally difficult and slow, for the regular service commences only from Yakutsk.

In all events, the Imperial Geographical Society of Russia will always feel happy if it can furnish even the smallest piece of information to the American Geographical Society, about the progress of Mr. Pavy's expedition.

Please accept, Mr. President, the assurance of my high consideration.

COUNT F. LUTKE,  
*Vice-President.*

32 WEST THIRTY-SIXTH STREET, }  
NEW YORK, Oct. 25, 1871. }

To Mr. E. R. STRAZNICKY:

DEAR SIR.—As I am preparing to reside abroad for an indefinite period, it is proper that I should signify to the American Geographical Society my resignation of the office of vice-president, with which it has honored me for so many years. I beg you to express to the Society my grateful sense of the dignity it has so often conferred upon me, and my earnest desire for its prosperity and usefulness.

I shall at all times be happy to further the objects of the Society, and shall hope at some future time to resume my active membership.

Be pleased, dear sir, to accept for yourself, and to express to my associates in office, my warm acknowledgment of the courtesy with which you have always honored me.

With high regard, very truly yours,

JOS. P. THOMPSON.

Regular monthly meeting of the American Geographical Society, Cooper Institute, New York, December 26, 1871. Chief Justice CHAS. P. DALY, the president, in the chair.

The minutes of the last meeting, November 28, 1871, were read and approved.

Hon. F. A. Conkling, as chairman of the Council, recommended the names of the following candidates as having been approved for election as

*Resident Members*—Brig.-Gen. A. von Steinwehr, Edmund B. O'Callaghan, LL.D., and John M. Bixby;

And by Hon. Townsend Harris, as a

*Corresponding Member*—Thomas E. Davis, Esq., in Rome.

No ballot being called for, on motion, these gentlemen were declared duly elected members of the Society.

Mr. Remsen, in the absence of Mr. Clews, read the treasurer's monthly report, exhibiting a cash balance of \$204.30.

In the absence of Mr. Hammond, the recording secretary read the librarian's monthly report, showing that during the last month sixty-one accessions were made to the library, by purchase and donation.

On motion, both reports were accepted, and ordered to be placed on file.

The president then called the attention of the Society to a very costly bound copy, in folio, of Ptolemy, printed in Rome in 1508, and restored by Mr. Henry Stevens, at his own expense, in London.

On the motion of the Hon. F. A. Conkling it was

*Resolved*, That the thanks of the Society be conveyed through the recording secretary to Mr. Stevens, for his generous contribution to the Society's collections.

Mr. Francis A. Stout then offered the following resolutions:

*Resolved*, 1. That, deeply sensible of the great honor conferred by the College of the Propaganda at Rome in selecting this Society to first receive, from its precious archives, copies of the celebrated map of Jerome Verrazano—a favor coveted and sought for years by the science of Europe, and finally graciously granted to the younger learning of America—this Society respectfully

tenders its thanks and high appreciation of the confidence and compliment implied.

*Resolved*, 2. That the thanks of the Society are eminently due to Mr. Davis for his earnest and thoughtful effort in aid of geography, and for the generous loan of his great influence in the Eternal City in procuring, from the College of the Propaganda, copies of the celebrated map of Verrazano.

*Resolved*, 3. That the recording secretary be requested to transmit authenticated copies of these resolutions to the College of the Propaganda, and to Thomas E. Davis, Esq., in Rome.

On motion of the Hon. Townsend Harris, seconded by the Hon. F. A. Conkling, these resolutions were unanimously adopted.

On motion of Prof. Thomas F. Harrison, it was

*Resolved*, That a special committee of three be appointed by the president, to prepare for the next annual meeting in January, 1872, suitable nominations for the election of officers for the ensuing year.

The president accordingly appointed Messrs. Harrison, Hull and Richards, as such committee.

The president then introduced to the Society the Rev. Edward Fontaine, a former graduate of West Point, who read a paper "On the Physical Geography of the Mississippi River and its Delta."

On motion of Judge Peabody, seconded by Mr. Conkling, the thanks of the Society were presented to Rev. Mr. Fontaine for his interesting and instructive paper, and a copy of it requested for publication in the Journal.

On motion, the meeting then adjourned.

E. R. STRAZNICKY,

*Recording Secretary.*

TRANSACTIONS OF THE SOCIETY FOR 1872.

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Annual meeting of the American Geographical Society, Cooper Institute, New York, January 30, 1872. Chief Justice CHAS. P. DALY, the president, in the chair.

The minutes of the last meeting, December 26, 1871. were read and approved.

Hon. F. A. Conkling, as chairman, read the annual report of Council for the year 1871.

Henry Clews, treasurer, read his annual report for the year 1871, exhibiting a cash balance in the treasury of \$130.89.

In the absence of Mr. H. B. Hammond, the librarian, Mr. W. H. H. Moore read his annual report for the year 1871.

On motion, these reports were accepted and ordered to be placed on file.

The Hon. F. A. Conkling, Chairman of the Council, reported the names of the following candidates as having been approved for election as

*Resident Members*—Horatio Moncrief Allen, Rutherford Stuyvesant, Henry Parish, Chandler Robbins, William Tracy, Edward Van Ness, Joseph P. Joachimsen.

No ballot being called for, on motion, these gentlemen were declared duly elected resident members of the Society.

Dr. Richards, on behalf of the nominating committee, reported that the following gentlemen are recommended for election, as officers of the Society, for the year 1872 :

*President*—CHARLES P. DALY, LL.D.

*Vice-Presidents*—HENRY GRINNELL, F. A. CONKLING, FRANCIS A. STOUT.

*Foreign Corresponding Secretary*.—TOWNSEND HARRIS.



*Domestic Corresponding Secretary*—W. H. H. MOORE.

*Recording Secretary*—E. R. STRAZNICKY, M. D., PH. D.

*Treasurer*—HENRY CLEWS.

*Librarian*—ELIAL F. HALL.

*Council*—WM. REMSEN, T. BAILEY MYERS, W. T. BLODGETT, W. E. CURTIS, THEO. W. DWIGHT, LL.D.; GEO. W. CULLUM, U. S. A.; LEWIS M. RUTHERFURD, GEO. CABOT WARD.

The president then appointed Messrs. Peabody and Bill as tellers, and recommended to proceed with the election after the delivery of the annual address.

The president then introduced to the Society Prof. Daniel C. Gilman, of Sheffield Scientific School, Yale College, who delivered the annual address, having for its subject, "American Contributions to Geographical Science during the last year."

After the conclusion of this highly interesting and instructive address, and on motion of General Viele, seconded by Judge Peabody, the thanks of the Society were presented to Prof. Gilman, and a copy requested for publication in the Journal.

The election of officers was now proceeded with, and Messrs. Peabody and Bill, as tellers, reported that the names on the ticket recommended for election had been unanimously elected.

On motion, the above named gentlemen were declared duly elected officers of this Society for the year 1872.

On motion, the meeting then adjourned.

E. R. STRAZNICKY,  
*Recording Secretary.*

## ANNUAL REPORT OF THE COUNCIL FOR 1871.

ROOMS OF THE AMERICAN GEOGRAPHICAL  
SOCIETY, COOPER INSTITUTE,  
NEW YORK, *Jan.* 30, 1872. }

Pursuant to chapter six, section three, of the by-laws of the Society, the Council have the honor to submit the following "general report of their proceedings and of those of the Society during the past year."

Since the date of the last annual report, January 31, 1871, ten stated meetings of the Council, eight meetings of the Society, and one public reception have been held at the rooms of the Society.

In April last, an act was passed by the Legislature of this State, amending the charter of the Society and changing its name to that of the "American Geographical Society of New York." The act provides that the Society shall have power to hold real estate of the value of three hundred thousand dollars, and also that it shall make an annual report of its proceedings to the Legislature.

From the following statement, it will be seen that the number of members has been considerably increased during the last year.

Number of members on January 31, 1871.....	540
Number since added .....	44
Total .....	584
Deduct for resignations and deaths.....	30
Number remaining on January 30, 1872.....	<u>554</u>

Among those of our immediate associates who have been removed by death, it is especially painful to mention the name of Archibald Russell, who was one of the founders of the Society and for many years one of its vice-presidents.

Of our foreign associates, several of the most eminent have passed away. Sir Roderick Impey Murchison, the late president of the Royal Geographical Society of London and an honorary member of this Society, died in the month of December last.

Mr. C. S. M. Olrick, Royal Danish Inspector of Greenland, died in the summer of 1871. As a corresponding member of our Society, he afforded valuable counsel and aid to the several arctic explorations which from time to time have been fitted out in this country.

The Council cannot refrain from expressing their sincere regret at the resignation by Rev. Joseph P. Thompson, D. D., of his office as one of the vice-presidents of the Society and at his withdrawal, which, it is hoped, will prove to be only temporary, from active participation in the management of its concerns. It will be remembered that, at the monthly meeting in November last, the Society, in grateful recognition of Dr. Thompson's many valuable services, elected him an honorary secretary for the purpose of representing it abroad.

The annual report of the treasurer, Henry Clews, Esq., shows a satisfactory condition of the finances of the Society.

By the annual report of the librarian, H. B. Hammond, Esq., it will be seen that very large additions have been made during the last year to our collection of books, maps and charts. The recent increase of the library renders it altogether probable that more ample space than we now possess will soon be required for its accommodation.

On January 31, 1871, the Society held its annual meeting and elected the present board of officers. Prof. D. C. Gilman, of Sheffield Scientific School, Yale College, delivered the annual address, selecting for his subject "The Last Ten Years of Geographical Work in this Country."

On February 28, Prof. W. H. Brewer, of Sheffield Scientific School, Yale College, delivered a discourse on his "Explorations in the Rocky Mountains and the High Peaks of Colorado."

On March 21, Gen. James Grant Wilson read a paper "On the North-west and its Discoveries."

On April 18, Gov. H. D. Gilpin, of Colorado, read an essay on the "Territory of Colorado and the City of Denver."

On May 16, Prof. C. F. Hartt, of Cornell University, delivered a discourse on his "Recent Explorations of the Amazonas."

On June 18, Walton Grinnell, Esq., read a paper on "Eastern Manchouria, with Observations on the Manners and Customs of the Inhabitants of Corea."

On June 26, a reception was given to Capt. Hall and the officers of the "Polaris," prior to their departure for the Arctic regions.

On November 28, J. Carson Brevoort, Esq., read a paper on "The History and Authority of the Verrazona Map," a copy of which, through the friendly intervention of Thos. E. Davis, Esq., was presented to this Society by the College of the Propaganda at Rome.

On December 26, Rev. Edward Fontaine read a paper "On the Physical Geography of the Mississippi River and its Delta."

The Council desire to record anew their grateful sense of obligation to the trustees of the Cooper Union, and especially to its benevolent founder, Peter Cooper, Esq., not only for the free use of these spacious rooms, which are so admirably adapted to our purposes, but likewise for their uniform courtesy and liberality in their dealings with the officers of this Society.

Respectfully submitted.

F. A. CONKLING,  
*Chairman of the Council.*

# ANNUAL REPORT OF THE TREASURER FOR 1871.

ROOMS OF THE AMERICAN GEOGRAPHICAL  
SOCIETY, COOPER INSTITUTE,  
NEW YORK, Jan. 30, 1872. }

The treasurer respectfully submits the following report, for the period from January 31, 1871, to January 30, 1872, of the receipts and disbursements of this Society:

<i>Receipts.</i>		
Balance from last year.....		\$169 52
One life membership, 1871.....	\$50 00	
Initiation fees from forty-two members...	420 00	
Annual dues for 1866 .....	5 00	
Annual dues for 1867 .....	5 00	
Annual dues for 1868 .....	5 00	
Annual dues for 1869 .....	10 00	
Annual dues for 1870 .....	50 00	
Carried forward.....	\$545 00	\$169 52

Brought forward .....	\$545 00	\$169 52
Annual dues for 1871 .....	1,667 50	
	<hr/>	
	\$2,212 50	
Special subscriptions .....	280 00	
Loans .....	500 00	
	<hr/>	2,942 50

Which, with the balance at the end of last year, make .....	<hr/>	\$3,112 02
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*Disbursements.*

Salaries .....	\$1,193 00
Purchases of books, maps, etc. ....	473 00
Furniture .....	118 34
Stationery .....	56 73
Printing .....	55 00
Sundry expenses for meetings, etc. ....	835 06
	<hr/>
	\$2,731 13
Loans repaid .....	250 00

Total disbursements .....	<hr/>	\$2,981 13
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Leaving a cash balance on hand of .....	\$130 89
If to this sum are added the uncollected dues of 500 resident paying members, at five dollars each. ...	2,500 00
And the outstanding dues for 1870 and 1871 .....	500 00

The available resources for the coming year will be	<hr/>	\$3,130 89
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In this sum are not included the initiation fees from prospective new members, which every year amount to about \$500.

Respectfully submitted.

HENRY CLEWS,  
*Treasurer.*

## ANNUAL REPORT OF THE LIBRARIAN FOR 1871.

ROOMS OF THE AMERICAN GEOGRAPHICAL  
SOCIETY, COOPER INSTITUTE,  
NEW YORK, Jan. 30, 1872. }

In accordance with the existing by-laws, the librarian respectfully presents the following report for the period commencing with the 31st January, 1871, and ending on the 30th January, 1872. The book of donations shows that, during that period, four hundred and fifty-two entries have been made, and that they are of the following description:

Volumes—Quartos.....	21
“ Octavos.....	332
“ Duodecimos.....	7
Pamphlets—Quartos.....	85
“ Octavos.....	514
Maps and charts.....	102
Total by donation.....	1,061

The book in which the purchases are recorded shows that three hundred and twenty-three entries have been made, and these comprise the following:

Volumes—Folios.....	16
“ Quartos.....	117
“ Octavos.....	280
“ Duodecimos.....	42
Pamphlets—Quartos.....	1
“ Octavos.....	42
Maps, charts, etc.....	62
Total by purchase.....	560
Grand total by purchase and donation.....	1,621

The donations have been equally as large, if not larger, than in former years, and are becoming constantly more valuable. They have been received for the most part from other societies, at home and abroad, with which we are now in regular correspondence and exchange. Among the donors are also a large number

of our own national, State, and municipal officers, and many private individuals, whose names will appear in alphabetical order in the printed report. It is proper, however, that the librarian should call the attention of the Society to a few of these donations, which will illustrate their present value. In the year 1869, Chief Justice Daly, the president, presented to the library a folio edition of Ptolemy, printed in Rome in 1508, and only lightly worn. Mr. Henry Stevens, one of our corresponding members, recognizing its value, offered to have it restored in London at his own expense by some competent hand. He took it accordingly to England, and the work has now been returned in magnificent condition, and is said to be worth, at a fair valuation, five hundred dollars.

Among the purchases it is proper to mention the acquisition of a large portion of the De Bry voyages for the comparatively small sum of \$175.00. In this purchase are included fifteen substantially bound atlases, and many other rare works of travels and histories, among others the first edition of Ortelius, printed in 1570, which was the first atlas ever issued, Cadamosco's voyages, printed in Nuremberg in 1508, being the first book of voyages ever published ; and in the Ptolemy above alluded to is found the first engraved map of America.

It is to be regretted that this large collection of rare and useful works, which is increasing so rapidly, should suffer for want of adequate accommodations and remain uncatalogued simply for the want of the necessary means.

Respectfully submitted.

HENRY B. HAMMOND,

*Librarian.*

ROOMS OF THE AMERICAN GEOGRAPHICAL  
SOCIETY, COOPER INSTITUTE,  
NEW YORK, Jan. 22, 1872. }

The undersigned, special committee appointed at the last regular monthly meeting of the Society, held December 26, 1871, for the purpose of preparing nominations for officers of this Society, to be elected on January 30, 1872, respectfully report that they would recommend the names of the following gentlemen to be elected as officers of this Society for the year 1872 :

*President*—Chief Justice CHAS. P. DALY, LL.D.

*Vice-Presidents*—HENRY GRINNELL, F. A. CONKLING, FRANCIS A. STOUT.

*Foreign Corresponding Secretary*—TOWNSEND HARRIS.

*Domestic Corresponding Secretary*—W. H. H. MOORE.

*Recording Secretary*—E. R. STRAZNICKY, M. D., Ph. D.

*Treasurer*—HENRY CLEWS.

*Librarian*—ELIAL F. HALL.

*Council*—WILLIAM REMSEN, T. BAILEY MYERS, WILLIAM T. BLODGETT, WILLIAM E. CURTIS, THEODORE W. DWIGHT, LL.D., LEWIS M. RUTHERFURD, GEORGE W. CULLUM, U. S. A., GEORGE CABOT WARD.

Respectfully submitted.

THOMAS F. HARRISON.

AMOS G. HULL.

JOSEPH W. RICHARDS.



## ALPHABETICAL LIST

OF

### DONORS TO THE LIBRARY AND MAP ROOMS.

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Abbott, Rev. Gorham D.....	New York.
Allen, Hon. W. F.....	Albany, N. Y.
Barton, Rev. E. M.....	Worcester, Mass.
Baz, Don Juan Jose .....	Governor of a Province. Mexico.
Behm, Dr.....	Gotha, Germany.
Bell, Hon. Isaac, Commissioner of Charities.....	New York.
Body, John E.....	New York
Bradlee, Rev. C. D.....	Boston, Mass.
Bradley, Rev. D. B.....	Bangkok, Siam.
Cassery, Hon. Bernard, Sec'y Board of Immigration ..	New York.
Causten, James H.....	Washington, D. C.
Clark, Henry.....	Rutland, Vt.
Coffin, Prof. J. H., Supt. Nautical Almanac ..	Washington, D. C.
Conkling, Col. F. A.....	New York.
Cook, Prof. Geo. H.....	State Geologist of New Jersey.
Cullum, Maj.-Gen. George W., U. S. A.....	New York.
Daly, Chief Justice Charles P., LL.D.....	New York.
D'Avezac, Member of the Institute .....	Paris.
Davison, E. F., Consul .....	New York.
De Costa, Rev. B. F.....	New York.
Dinsmore, S. P.....	New York.
Dodge, Robert .....	New York.
Döell, Eduard.....	Vienna, Austria.
Douglass, Hon. James, President Literary and Historical Society.....	Quebec, Ca.
Du Chaillu, Paul B.....	New York.

Foetterle, Franz .....	Vienna, Austria.
Foster, Henry, Recording Secretary, Pawcatuck Library Association.....	Providence, R. I.
Fox, Hon. A. L., Secretary Royal Cornwall Polytechnic Society.....	Falmouth, Eng.
Fulton, A. R., Secretary Iowa Board of Immigration..	Iowa City.
Garfield, M. C., Hon. J. H.....	Washington, D. C.
Gildersleeve, Charles E., Secretary Metropolitan Fire Department.....	New York.
Hall, E. Hepple.....	New York.
Hancock, William Neilson, LL.D.....	Dublin, Ireland.
Harbaugh, Hon. S. G., State Librarian.....	Columbus, Ohio.
Hartt, Prof. Chas. Fred., M. A., Cornell University..	Ithaca, N. Y.
Hellwald, F. von.....	Vienna, Austria.
Henry, Prof. Joseph, LL.D., Secretary Smithsonian Institution.....	Washington, D. C.
Hilgard, J. E., U. S. Coast Survey .....	Washington, D. C.
Hisch, A.....	Geneva, Switzerland.
Hitchcock, Prof. C. H., Ph. D.....	Concord, N. H.
Hoffman, Hon. John T., Governor State of New York..	Albany.
Hoffmann, Frederick, Ph. D. ....	New York.
Hopkins, Edward D.....	Buenos Ayres, S. A.
Home Insurance Company.....	New York.
Hubbs, I. G.....	New York.
Hull, Prof. T.....	New York.
Humphreys, General A. A., U. S. A., Chief of Engineers,	Washington, D. C.
Hunt, Prof. T. Sterry.....	Montreal, Ca.
Huntington, J. H., Assistant State Geologist of New Hampshire.	
Jarvis, Nathaniel, Jr.....	New York.
Jay, Miss Elizabeth Clarkson.....	New York.
Judd, Hon. Orange.....	New York.
Kaltbrunner, Dr.....	Zurich.
Knapp, Hon. Frederick.....	New York.
Lapham, I. A. ....	Milwaukie, Wis.
Lloyd, F., Corresponding Secretary State Histor. Society of Iowa.	

- Loosey, C. F. de, Austrian Consul-General .....New York.  
 McCartee, Divie Bethune, M. D.....Hong Kong, China.  
 Maclay, Dr.....New York.  
 McCormick, Hon. R. C., M. C.....Arizona.  
 Malte-Brun, V. A.....Paris.  
 Mansill, Richard.....Rock Island, Ill.  
 Markham, Clements R., F. S. A., Secretary Royal Geographical  
 Society.....London.  
 Martino, Don Francisco Garcia, Director-General of Statis-  
 tics.....Madrid.  
 Maury, M. F., LL.D.....Lexington, Va.  
 Mohn, John H., Director Royal Norwegian Meteorological Insti-  
 tute .....Christiania.  
 Morris, Dr. Moreau, Sanitary Superintendent.....New York.  
 Mumford, J. P.....New York.  
 Myers, Col. T. Bailey .....New York.  
 Naphegyi, Dr. G.....New York.  
 Negri, Comm. Cristoforo, President Italian Geographical  
 Society.....Florence.  
 Nelson, Hon. Homer A.....Albany, N. Y.  
 Newberry, Prof. John S., M. D., Columbia College..New York.  
 Newmarch, William N., President Statistical Society...London.  
 Nichols, Hon. Geo., Secretary of State of Vermont..Montpelier.  
 Nye, Hon. Gideon.....Canton, China.  
 O'Reilly, Henry .....New York.  
 Osten-Sacken, Baron R. ....New York.  
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 Pierce, Prof. Benjamin, Superintendent United States Coast Sur-  
 vey.....Washington, D. C.  
 Pierrepont, Hon. Edwards .....New York.  
 Posadas, Don Gervasio de.....Buenos Ayres, S. A.  
 Potter, Hon. Clarkson N., M. C.....Washington, D. C.  
 Pruyn, Hon. John V. L.....Albany, N. Y.

Raymond, Capt. Chas. W., U. S. A., Corps of Engineers, New York.  
 Reavis, L. U. .... St. Louis, Mo.  
 Renwick, Heirs of Prof. James. .... New York.  
 Romero, Senor Matthias, Minister of Finance. .... Mexico.  
 Rosing, Johannes, Consul-General, German Empire.. New York.  
 Rowell, Geo. P., & Co. .... New York.  
 Ruggles, Wm. Oakley. .... New York.

Sabin, Joseph. .... New York.  
 Sabine, Sir E., President Royal Society. .... London.  
 Sands, Commodore B. F., U. S. N., Superintendent Naval  
 Observatory. .... Washington, D. C.  
 Schieffelin, H. M. .... New York.  
 Sherwood, Hon. Isaac R. .... Secretary of State of Ohio.  
 Siemon, G. G., Bavarian Consul. .... New York.  
 Squier, Hon. E. George. .... New York.  
 Steinwehr, General A. von. .... New Haven, Ct.  
 Stevens, Henry. .... London.  
 Stevens, Simon. .... New York.  
 Stoddard, W. O. .... New York.  
 Stout, Francis A. .... New York.  
 Stuckle, Henry. .... New York.

Taintor, E. C. .... Canton, China.  
 Tellkamp, Theo. A., M. D. .... New York.  
 Thompson, Rev. Joseph P., D. D. .... New York.  
 Todd, Hon. Alpheus, M. P. .... Ottawa, Ca.  
 Townsend, E. D., Adjutant-General, U. S. A., Washington, D. C.  
 Townsend, Franklin, Adj.-Gen. State New York. .... Albany.  
 Trow, John F. .... New York.  
 Trumbull, J. H., President of the State Historical Society of  
 Connecticut. .... Hartford.

Vanderpoel, Aaron J. .... New York.  
 Van Nort, G. M., Commissioner Public Works. .... New York.  
 Vaux, Calvert, Architect. .... New York.  
 Vaux, William S., Vice-Pres't Acad. Nat. Sciences. . Philadelphia.  
 Vincent, Francis. .... Wilmington, Del.  
 Weaver, Abram S., Superintendent Public Instruction.. Albany.

Weed, Parsons & Co. . . . . Albany, N. Y.  
 Wells, David A., Special Com. of Revenue . . . Washington, D. C.  
 Wheatley, Prof. C. M., State Geologist of Pa. . . . . New York.  
 Wheeler, J. B., U. S. A. . . . . Washington, D. C.  
 Wilder, Rev. H. A. . . . . Natal, South Africa.  
 Wilson, George, Secretary Chamber of Commerce . . . New York.  
 Wilson, Gen. James Grant . . . . . New York.  
 Wood, Hon. Fernando, M. C. . . . . Washington, D. C.  
 Woolworth, S. B., LL.D. . . . . Albany, N. Y.  
 Worrall, Col. James. . . . . Harrisburg, Pa.  
 Wright, H. T. . . . . Melbourne, Australia.

### INSTITUTIONS.

Academy of Natural Sciences, Philadelphia, Pa.  
 Altenburg Society of Natural History.  
 American Antiquarian Society, Worcester, Mass.  
 American Museum of Natural History, New York.  
 Astor Library, New York.  
 Bombay Geographical Society.  
 Chamber of Commerce, New York.  
 Department of Public Parks, New York.  
 Department of Public Works, New York.  
 Edinburgh Geological Society.  
 Essex Institute, Salem, Mass.  
 Ferdinandeum in Inspruck.  
 Grand Ducal Bureau of Statistics for Hesse-Darmstadt.  
 Geographical Society, Geneva, Switzerland.  
 Geographical Society, Paris.  
 Geographical and Statistical Society, Mexico.  
 Geographical and Statistical Society, Frankfort.  
 Hungarian Academy of Sciences, Pesth.  
 Imperial Academy of Sciences, St. Petersburg, Russia.  
 Imperial Academy of Sciences in Vienna.  
 Imperial Geological Institute in Vienna.

Imperial Geographical Society, Vienna.

Imperial Prussian Statistical Bureau in Berlin.

Imperial Prussian Statistics Bureau in Bremen.

Iowa State Historical Society, Iowa City.

Italian Geographical Society, Florence.

Lyceum of Natural History, New York.

Meteorological Institute of the Netherlands, Utrecht.

Metropolitan Fire Department, New York.

Naturforschende Gessellschaft in Emden.

New York Association for Improving the Condition of the Poor,  
New York.

Pawcatuck Library Association, Providence, R. I.

Peabody Academy of Sciences, Salem, Mass.

Pulkowa Observatory in Russia.

Royal Norwegian University of Christiania, Norway.

Royal Academy of Sciences in Munich.

Royal Society of Sciences in Gottingen.

Royal Society of Sciences in Copenhagen.

Royal Statistical Bureau of Sweden, in Stockholm.

Royal Society of London, England.

Royal Society of Victoria, Melbourne, Australia.

Smithsonian Institution, Washington, D. C.

Verein fur Erdkunde zu Leipzig.



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## PART II.

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### PAPERS READ BEFORE THE SOCIETY

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(N. B.—THE AUTHORS ARE ALONE RESPONSIBLE FOR THE CONTENTS OF  
THEIR RESPECTIVE PAPERS.)

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# I. ANNUAL ADDRESS.

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BY PROF. DANIEL C. GILMAN,  
Of Sheffield Scientific School, Yale College.

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**SUBJECT: THE LAST TEN YEARS OF GEOGRAPHICAL  
WORK IN THIS COUNTRY.**

READ JANUARY 31ST, 1871.

MR. PRESIDENT: My theme will be the contributions to geographical science made within the last ten years, relative to the territory of the United States. The subject is quite too vast for a single lecture; but I shall call your attention to the more important points, and show in what method the results can best be reached by the student of geography.

## I. WHO HAVE BEEN THE WORKERS?

Most deserving of mention are the various departments of the United States Government, including the coast survey, the engineers of the army, the surveyors of the Land Office, the cartographers of the Indian Bureau, the Hydrographic Bureau, the government county boundary commissions, and the Smithsonian Institution.

Two of these organizations deserve special recognition. The United States Coast Survey is one which, under the successive administrations of Hassler, Bache and Pierce, has added so much to the scientific renown of the country, and has furnished us with such accurate knowledge, not only of the coast, but of the subaqueous bottom upon the Atlantic, the Gulf and the Pacific shores, and also,

during the war, so many important regions of the interior. The latest volume of the survey, recently published, though bearing date for the year 1867 (being the first issued under the general administration of Mr. Pierce), is more than usually explicit in respect to the exact status of the survey, and contains a good outline map, by which its exact progress on the Atlantic coast may readily be ascertained. Less familiarly known to the public in general, but likewise highly meritorious, is the work of the engineer of the army, which, in time of peace, is largely directed (in addition to the building of fortifications) to the examination of our rivers, of our lakes; to the determination of new routes through the western country, and of the best methods of improving and developing our interior resources.

II. In addition to the work of the general government, many of the separate States and Territories are also engaged on a more or less comprehensive plan in the maintenance of geological surveys, boundary measurements, and other investigations respecting the interior structure and natural resources of the various regions; and the neighboring Dominion of Canada, in the prosecution of its geological survey, has made very important contributions to the knowledge of the geology of the United States, especially in the northern and eastern regions. Among all the surveys of the several States none is more deserving of honor than that of California, conducted by Prof. I. D. Whiting, while the recent maps published by the surveys of New Jersey, Ohio and Indiana also deserve notice.

III. In addition to these governmental investigations, the great corporations engaged in the construction of railroads, and in kindred public works, are continually adding to our knowledge of the interior. If it be said that a corporation has no soul, it cannot be claimed that it has no intellect, for the highest intellectual forces of the country have been employed upon the survey of new

routes of transit, especially through our western mountains. It is only necessary to mention the Union and Central Pacific railroads now completed, the Kansas Pacific, and Northern Pacific railroads, and the work of the Western Union Telegraph Company, which have all added so much to our knowledge of the west.

IV. We have also the enterprises of private individuals, inspired by a love of science, adventure or fame, which have led so many men of eminent ability, by so many different routes, into so many different places, and often with such vast results for geographical science.

We may briefly mention among the most noteworthy, the exploration of Powell on the canon of the Colorado, of Whitney and Brewer in the measurement of lofty peaks, and of Marsh and his party of student geologists along the route of the Central and Union Pacific railroads, of Langford, Washburn and their associates to the geysers of Montana, and the able writer, Richardson, and many other observing travelers and letter-writers, whose books contain bright pictures of the condition of society, even if they do not add much to our knowledge of the physical peculiarities of the country.

#### WHERE ARE THE RESULTS?

These, then, are the workers. Where are their results to be found? In the first place, we look for them in the government offices at Washington, in the manuscript records, in the printed documents, irregularly distributed, often very inaccessible to those who are most desirous of obtaining their contents. The extreme difficulty of ascertaining what there is in the various departments of the general government is only surpassed by the difficulty of knowing how to get at it. The various workers to whom reference has been made, in their official labors are responsible to the different departments of the general government; for example, it is in the War Department that we find the work of the army engineers and other

military officers ; but not all the work of the army officers is at once reported to the head-quarters at Washington ; much of it remains in the hands of the heads of the military departments, especially of the Pacific slope. The coast survey is under the direction of the Secretary of the Treasury. To this department we must go for the results accomplished by the Land Office and the Indian Bureau.

The Post-office Department makes its own maps. Commissions for the settlement of its national boundaries are responsible to the Department of State. The Navy Department maintains the Hydrographic Bureau. The Smithsonian Institution co-operates with explorers and investigators in any or in all of these departments ; and, to crown all, both in the Senate and the House of Representatives, special congressional committees often bring out and print and publish important papers and memoirs, which proceed not from any one of the established departments of the government. Now, it is very puzzling to the geographical student, in consequence of the mode in which these various papers are distributed, to know how to bring together, at any one time, the results of so many different investigations. It sometimes appears as if these departments were not acquainted with each other's work, and felt still less of interest in the work of savans who are engaged in similar researches. Some of these facts may point to the incompleteness of our civil service ; for while we have so many able officers of the government engaged in investigations of the highest value to mankind, much of their usefulness is impaired by the defective arrangements for gathering up, presenting and distributing to the public the results thus ascertained. They likewise point to the importance of having established in Washington, or elsewhere, as a department of the general government, a bureau of maps and charts and geographical memoirs, where all these vast accumulations may be stored, classified and rendered

accessible, like the books in the library of Congress, or the books and models in the Patent Office, so that persons who have the right may make inquiry respecting them.

We must also turn to the Transactions of scientific associations ; and although we have but one Geographical Society in the country, there are many learned bodies which are accustomed to print important data in the different departments of geographical science. Not to mention those with which we are most familiar, in the Eastern States, it is fit to notice here that three Western cities — San Francisco, St. Louis and Chicago — are publishing Transactions of very great value to the students of geography. In the former, we may find many papers by Whitney, Williamson, Hoffman and other workers on the Pacific coast. The St. Louis Transactions contain many of the results to which Parry and Engelman have arrived, and the newer volume of the Chicago Academy gives us a most interesting account of the life and work of the lamented Kennicott.

We must turn, also, to the journals and newspapers ; not merely those of scientific reputation, like the *American Journal of Science* and the *American Naturalist*, but to the literary periodicals, many of the articles of which have a mountain flavor — the *Overland Monthly*, Harper, Lippincott and the *Atlantic* ; for they, as well as the daily newspapers, bring out, over the signatures of the authors, many important papers which the student cannot possibly pass by.

There is no time for me to dwell upon the books of travel, written so frequently in these days, by those who pass from ocean to ocean.

Photographs, likewise, should be collected and studied, if we would have accurate conceptions of the regions which we cannot ourselves visit, for they often convey to the eye clearer impressions of the structure of the country than many pages of description. Finally, we must turn

to the general maps, which, in the language of cartography, may be supposed to present to us, adjusted and winnowed, the combined results from multitudes of investigations. Five government maps hang before you, recently published by different departments of the government, which exhibit, down to a very recent period, the progress of investigation in this country. On the map of the Post-office Department is delineated the position of all postal stations and the ordinary routes of communication between them. On the map of the Indian Bureau we see what is now known respecting the distribution of the aboriginal tribes in the far west. The map of the Land Office is intended to exhibit that portion of the public domain already surveyed by the general government, and so far as that, at least, appropriated for settlement. On it are noted, also, the deposits of precious and useful metals; but it is a map without mountains, and, therefore, of little consequence to the student of topography.

For topographical knowledge, we must turn to the work of the engineers in the War Department. The well-known map of Gen. Warren, successively re-edited and republished, gives us, in four sheets, the most minute general exhibition of what is known to the engineers respecting the topography of our country west of the Mississippi; while the smaller map, covering the entire territory of the United States, and published still more recently, exhibits to the eye, not merely the topography and hydrography, but also the railroad routes, the position of important towns, and, consequently, the proper military lines of communication.

But if we turn from maps to literary or descriptive generalizations of the knowledge thus ascertained respecting our territory, we look in vain for anything which is satisfactory. A few pages in Dana's *Geology*, or a few in Whitney's *Guide to the Yo Semite valley*, brief and concise as they are, give, perhaps, better notions respect-

ing the western territory than can be ascertained from any larger works. It is hardly time for any one, within the limits of any single volume, or even any single article, to sum up and give to the world, in language, a picture of our western territory, for every year and every month are adding to our knowledge.

From this brief sketch of the workers, and of the places to which we must turn in order to ascertain their results, let us proceed to consider somewhat more in detail the contributions which have been made to our knowledge of the physical structure of the United States. We shall find it convenient to consider consecutively three distinct regions—the Appalachian system, the Mississippi valley and the Cordilleras, to which may be added some notice of our new possessions in Alaska.

By the Appalachian region we understand the lofty ranges of mountains which culminate, in the north, in the White Mountains of New Hampshire, and on the south in the Black Doe, and its adjacent peaks in North Carolina, together with the Atlantic slope, and what we know of the submerged coast.

By the Mississippi region we understand the great basin which lies between the Appalachians on the east and the Rocky Mountains on the west, extending from the vast system of lakes on the north to the Gulf of Mexico on the south, and including the area drained by the Missouri on the one side and the Ohio on the opposite.

The term “Cordilleras of the United States,” as proposed by Prof. Whitney, and accepted by many others, is a fit designation for all that vast and intricate system of upheavals lying along the western portion of our territory, including the Rocky Mountains and their prolongation to the north, the basins and mountain chains of the interior plateau, with the Sierras and Cascade Mountains of the Pacific. Let us briefly see what has been done in each of these three great divisions of our territory.

The best general map which we have of our Appa-



lachian chain is that prepared by Mr. Ernest Landoz, originally published in Petermann's Journal, and reprinted in the American Journal of Science. It embodies the original researches of Guyot, in addition to the data obtained by other mountain measurers. I speak of it more particularly, as it often escapes the notice of those most interested in its facts, and because the memoir of Guyot, published in connection with it, brings together so much that is exact and important respecting the structure of this mountain system, an acquaintance with which is fundamental to our acquaintance with the Atlantic region. The United States Engineer Bureau, since the war closed, has been engaged in making beautiful and minute delineations of the most important battle-fields east of the Appalachian regions. Fifteen hundred square miles have been surveyed, and the results of the work have been brought out in nearly two hundred sheets. The index map, which hangs before you, shows how much of the territory has thus been covered. When we see the minuteness and completeness of this work, it makes us long to have a similar investigation prosecuted along the entire seaboard.

The Coast Survey, in addition to its peculiar work, has co-operated with the city of Portland, in Maine, in the production of a map of that harbor and the adjacent region, which is a fine sample of what may be done for any of our large towns. Of a very different character, though equally noteworthy, is a paper on the topography of New Haven, recently published by Prof. Dana, in which we have a good sample of the work of an able geologist in his travels about home. The State of Maine, influenced, doubtless, by a regard for the financial prosperity of that district, has published a volume illustrative of the river courses and the tributary regions of that State; and, although the maps are not all that we could desire, the enterprise thus displayed is worthy of commendation.

Through the geological survey of New Jersey, we have,

also, a new and important map of that State, which is wanting in the delineation of mountains, but is full and accurate in the presentation of the river courses and coast lines, and is also colored to exhibit the geological strata. Many noteworthy researches have been in progress, under the direction of the engineers of the army, for the improvement of the various rivers of this coast, but, for the most part, the results are given to the public in the most general forms.

On the whole, it is rather a disgrace to us that so little has been done, within the last ten years, for adding to our knowledge of this, the oldest, the most enlightened and the most thickly populated portion of our territory. We have, at this day, many better maps of vast regions in the Cordilleras than we have of the eastern States; and many amusing, if they were not unfortunate, illustrations of our defective knowledge of the east might be cited. For example, when the marshal of the State of Connecticut applied to the authorities of the State for a map, on which could be based the investigations of the census of 1870, it was impossible to furnish one of sufficient accuracy, for the published areas of that little State differ several hundred square miles in extent. If this be true, it can hardly be surprising that the popular guide-book, sold to all the travelers who go up the Connecticut valley, in their summer journeys to the White Mountains and various other resorts, informs the passer-by that the first lands seen by the mariner, as he enters the harbor of New Haven, are the hanging hills of Meriden, between New Haven and Hartford. A school-book on geography is still published in one of our eastern towns, in which it is stated that the White Mountains are so called because their summits are above the level of perpetual snow. It is not many weeks since I received a letter from Prof. Guyot, in which he said that he had ascertained, during the last summer, not only that the highest peak, so called, of the Catskill Mountains was not in reality the highest

peak, but that there are several near to it which surpassed in altitude the so-called summit; and this in the vicinity of one of our most favored places of resort during the summer season. To this day, the best general map of New England, exhibiting its natural structure, with which I am familiar, is that which illustrates the "History of New England," by Dr. Palfrey, published about ten years ago.

I dwell upon these points, not for the sake of publishing our ignorance, but to excite those who are fond of geographical investigation and inquiry to greater diligence in the study of their own neighborhoods. Why should there not be Appalachian clubs as well as Alpine clubs for the investigation of this most beautiful and diversified country?

If we turn from the Appalachian region to the great interior valley which so thoroughly characterizes the structure of the United States, we shall discover that it is to the engineers of the United States Army that we are most indebted. Chief among many valuable contributions stands the elaborate and wonderful treatise on the physics and hydraulics of the Mississippi river, by Generals A. A. Humphreys and H. L. Abbott, which will always deserve to be everywhere recognized as among the great contributions of the army to the science of the country. It is valuable in a great variety of aspects, but it is chiefly to be noticed in this connection for its accurate and systematic survey, not only of the chief river, the Mississippi, but also of all the various tributaries which flow into that great stream. Besides this survey of the Mississippi river, the engineer department has given us a survey of the northern lakes, which rivals in beauty and accuracy any similar hydrographic work. It would be utterly impossible for me to give you, within the limits of this lecture, any adequate conception of the variety of investigations which the Engineer Department have undertaken in the interior, and of the thoroughness

with which their work has been done under the general guidance of the chief of the corps, Gen. A. A. Humphreys. Turn only to the volume of 1870, the last which has been published, in which you may find notices of the investigations which were making in respect to the geological age of the Mississippi Delta ; of the investigations showing the feasibility of storing water in the lakes at the head waters of the upper Mississippi river, so as to secure a good navigable stage of water at all times ; an inquiry into the possibility of stopping the recession of the Falls of St. Anthony ; an account of the continued progress of the lake survey under Lieut.-Col. Reynolds ; and a statement of the progress of the publication of maps of campaigns and battle-fields.

There are various geological surveys in progress under the direction of the various States of the interior and of the United States Geologist, Dr. Hayden, and Prof. I. S. Newberry, has presented general conclusions in respect to the structure of the Interior Basin.

When we turn from the interior valley to the great mountain upheavals known under the general name of the Cordilleras, it is still more difficult to sum up and generalize the work that has been accomplished. Among most interesting topics to be considered are :

(1.) The work of the great railroad corporations — central, northern and southern — already alluded to.

(2.) The work of the North-western Boundary Commission.

(3.) The work of the California Geological Survey.

(4.) The exploration of the Colorado canon.

(5.) The survey of the fortieth parallel by Mr. King and his associates, under the auspices of the United States engineers.

(6.) The examination of the Colorado peaks and parks by Parry and Engelmann, by Whitney, Brewer and Hoffman, by Gilpin and by others.

(7.) The surprising stories which come to us of the geysers of the Upper Yellowstone.

(8.) The surveys in Washington Territory.

(9.) The work of Wheeler in western Nevada; and

(10.) The survey of Arizona, by Gardner.

I doubt whether any one will question that the most important geographical work, during the period which we are considering, is the survey of the State of California, commenced in 1860, and still (after an unfortunate interruption) going forward under the guidance of Prof. J. D. Whitney. When we consider the vast area of the State of California, which is twenty-four times the area of the State of Massachusetts, and nearly equal to the area of all New England, New York, Pennsylvania and Ohio; when we consider that fourteen-fifteenths of the territory may rightly be called mountains; when we consider the very interesting structure of the territory, both in its general outlines and in its detailed features, together with the great mineral, agricultural and commercial advantages of the region, we must rejoice that at so early a period in its career as a member of the American Union, "the Golden State" has undertaken this survey, and has entrusted its guidance to one of the most learned and efficient men of science which our country has produced. Technically, the work entrusted to Prof. Whitney is that of a geological survey; but he has rightly determined that no good geological work could be published unless it were based upon a good topographical survey; so he has everywhere entered upon measurements of heights and distances; has explored vast regions hitherto unexplored; has worked over the existing geographical material accumulated in the Land Office and in the Pacific Railroad reports, and has prepared for publication a series of admirably drawn maps, two of which, at least, are now before the public. He has also examined the botany and the zoology of the State, as well as the mines and mineral resources, having

been aided by Prof. W. H. Brewer, as chief assistant ; by Messrs. Ashburner, Hoffman, Cooper, Gabb, Gardner and King, and others in different departments of the work. Three large volumes have already appeared, the first of which is a sort of historical record of the work of the survey ; several more volumes are contemplated — possibly twelve or thirteen — one of which will be devoted to the physical geography of California. Such a theme, under such treatment, will make a book of surpassing interest. The survey, thus carried forward, has made clear the general structure of the country which is thus described by Prof. Whitney.

In order to bring vividly before the mind the grand simplicity of the topographical features of California, we may draw on the map of the State five equi-distant parallel lines, having a direction north thirty-one degrees west, and fifty-five miles apart.

Let the middle one of these be drawn at the western base of the Sierra Nevada, touching the edge of the foothills, as it will be found to do with the given direction, from Visalea to Red Bluff ; the first parallel line east of this, drawn at fifty-five miles distance, will pass through or very near the highest points of the Sierra Nevada, beginning with Mt. Shasta on the north, and touching in succession, toward the south, first Lassen's Peak, then Spanish Peak, Pilot Peak, the Downeyville Buttes, Pyramid Peak, Castle Peak, Mt. Dana, to Mt. San Bernardino and San Jacinto, touching also the high group of peaks discovered during the explorations of 1864. This line, if straight, would pass very near the culminating peaks of the Sierras for 500 miles.

The next parallel east of this (at the same distance of fifty-five miles) crosses a series of depressions, occupied by lakes and deserts. The Klamath, Wright, Pyramid and Walker lakes, Death valley, Soda lake and the sink of the Mojave lie on it.

The first line to the west of the central one will be found

to follow very closely the eastern base of the coast ranges, from near Kern lake northward, for near 300 miles.

The second line west, and last parallel, represents very nearly the coast line of the Pacific, or the western base of the coast ranges. \* \* \* These lines divide the State into four belts of nearly equal width, which preserve their main physical features over about five degrees of latitude, and for a distance of 400 miles, which embrace the most important part of the State, comprising nearly the whole of the agricultural, and by far the most of the mineral districts. These belts are designated as follows, naming them from the east to the west: The Eastern Slope, the Sierra Nevada, the Great Californian Valley and the Coast Ranges.

One of the most noteworthy and generally interesting results of the survey has been the discovery of a region of mountain peaks in the south-eastern portion of the State, between the parallels  $36^{\circ}$  and  $37^{\circ}$ , which were found to contain the loftiest peaks yet known to be in existence within the limits of the United States, not taking into account Mt. St. Elias on the boundary of Alaska, the height of which is still undetermined with precision. The colossal magnitude of this mountain mass, which may be known under the appellation of the "High Sierra," entitles it to the most respectful consideration in a review like the present.

During the summer of 1864, a reconnoissance was made of a region hitherto entirely unknown, lying between the Yo Semite trail to Mono lake, on the north, and Walker's pass, on the south. Glimpses of these summits from Mt. Bullion, had led Mr. King to suppose that here were the most elevated summits, and, accordingly, a party under the lead of Prof. Brewer, consisting of Messrs. Hoffman, King, Gardner and Cotter, and protected by a military escort, was fitted out to ascertain the truth. Three summer months were spent on the expedition, the crowning

glory of which was the discovery of a peak more than 15,000 feet, several over 14,000 in elevation, and many above 13,000; the group constituting, in the opinion of Prof. Whitney, "the grandest mountain mass of the North American continent." An area of over 10,000 square miles was examined, of which previously not even the topographical outlines were known.

The limits of this address will not permit even a summary of the account which is given in the first volume of the Report of the Geological Survey of California, but some reference *must* be made to the highest point of interest.

Probably as much that is grand and instructive can be seen from Mt. Brewer as from any other one position; for although a thousand feet or more (13,886) lower than the highest peak, it stands in such a relation to it, and to the other fourteen-thousanders, that the view upon its summit is described as one of the most sublime even in the sublimest portion of the Sierra. It is the culminating point of the western ridge of the Sierra, its sides rising very steep through the first 12,000 feet of ascent, — the southern wall being almost vertical for 1,000 feet. Snowy peaks over 11,000 feet in height cover an area of twenty-five square miles. Ten miles east is a ridge or crest on which are the summits known as Tyndall, Williamson and Whitney, and many equally noble elevations; on this ridge fourteen peaks are visible, ten as high as Mt. Brewer; four higher; and south, about eight miles, is the peak Kaweah. From Mt. Brewer the view near by is thus described by Mr. Gardner:

"Canons from two to five thousand feet deep, between their ridges, topped with pinnacles sharp as needles; successions of great, crater-like amphitheaters, with crowning precipices over sweeping snow-fields and frozen lakes; everywhere naked and shattered granite, without a sign of vegetation, except where a few gnarled and



storm-beaten pines cling to the rocks in the deeper canons.

“The result of the summer’s reconnoissance has been that a general idea is secured of the topography of a region about as large as Massachusetts, lying wholly within the State of California, and of which nothing whatever was known previously to this. That mountain peaks should be found to exist in this part of the State, higher than any known to exist in the United States, is a discovery equally interesting and unexpected. The details of this exploration will furnish many facts of great geological and geographical interest.”

Ten years has added much to our knowledge of noble groups of mountains in central Colorado, the Rocky Mountains proper. For a long period our maps indicated the position of but two lofty peaks, one of which bore the name of Col. S. H. Long, whose explorations were made in the year 1820, while the other, originally called James’s Peak, after the surgeon and botanist of Long’s party who first ascended the summit in 1820, is now called Pike’s Peak, after the explorer who calculated its height in 1806.

*Pike’s Peak* was ascended in 1862 by Dr. C. C. Parry, the well-known botanist, who carried with him a barometer, and, with the aid of Dr. Engelmann, of St. Louis, ascertained the height to be 14,216 feet. It is very remarkable that, if we make allowance for an error clearly pointed out in James’ commutation-base, we should find that his measurement (14,300 feet, as corrected) does not differ more than a hundred feet from that of Dr. Parry. We may, therefore, rest with some composure on the figure of 14,000, plus 200 or 300 feet, as the altitude of Pike’s Peak — which is 2,500 feet more than our most common gazetteer assigns to it. Another rival claimant for our respect, still unintroducted upon our maps, is

*Gray’s Peak*, or peaks — two summits, one of which bears the name of the Camor-Botar ; the other, that of Dr.

Torrey, the botanist, of New York. It was a natural tribute on the part of the botanist, Parry, to associate their names with a region of so much interest, and with elevations where the vegetation of many climes is recorded within a range of a few hours' climbing. We have two sprightly accounts of the ascent of Gray's Peak, to the height of 14,251 feet—one of them by Mr. Bowles, of Springfield, and his party, in 1868; the other by Mr. R. W. Raymond, published in a recent number of the *Overland Monthly*. The view, in Bowles' estimate, from Gray's Peak, was the great sight in all his Colorado travel. "In impressiveness, in overcomingness, it takes rank with three or four great natural wonders of the world—with Niagara Falls from the Tower, and Yosemite Valley from Inspiration Point." Owing to the fact that mining has been carried as high as 12,000 feet, a wagon road ascends two-thirds of the way to the summit, with a horse trail beyond; so that Gray's Peak, a few years hence, will be one of the things "to be done" by tourists tired of Mount Washington or weary of the Adirondacks. Lincoln is the name assigned to "the great parent mount of ye parent range" which stands at the north-west angle of South Park, and may be easily ascended from Montgomery—up and back in five hours. The tourists dispute as to which summit offers the finest view, Gray's Peak or Mt. Lincoln, to which it is nearly parallel in altitude. (Bowles, *P. R. R.*, 38 Switz., 114.) "Peer among presidents and mother among mountains" is Lincoln. The higher Gray's Peak is as high, possibly a hundred or two feet higher; but Mt. Lincoln is broader, more majestic, more mountainous. Out from its wide-spreading folds stretch three or four lines of snow-covered mountains; within its recesses spring the waters of three great rivers—the Platte, the Arkansas and the Colorado—that fertilize the plains of half the continent, and bury themselves, at last, two in the Atlantic and the third in the Pacific Ocean. This is the initial point in our

geography and a fountain-head of national wealth and strength.

Bayard Taylor's reference to this peak is given in a letter which described his passage from the Middle Peak to South Peak, over a pass on the edge of Mt. Lincoln. He says :

"Directly to the west of us rose a knot of tremendous snowy steeps, crowned by a white, unbroken cone. This is Mt. Lincoln, believed to be the highest point in Colorado. The estimates vary between fifteen and eighteen thousand feet; but the most trustworthy measurement, which also corresponds with its apparent elevation above the pass — is sixteen thousand six hundred feet. Later in the season, it can be ascended without much difficulty.

"It is fortunate that this prominent summit is so appropriately named. It is the central point from which at least four snowy ranges radiate, is one thousand feet higher than any peak which has yet been measured, and the view from its snowy apex can hardly be drawn with a shorter radius than one hundred and fifty miles. Although not standing alone, like the volcanic cones of Oregon, but in the midst of a sublime Alpine world, it yet asserts its supremacy, and its huge, wintry buttresses form a prominent feature in the landscapes of the South Park. Lopris, some seventy miles west of Mt. Lincoln, is thought to be even higher."

In the summer of 1869, Prof. J. D. Whitney, accompanied by two of his former associates in the California Geological Survey, made triangulation of the region between Gray's Peak and the south edge of South Park, a map of which has been drawn on a scale of two miles to the inch. It covers an area of 3,500 square miles, including the whole of South Park.

One of the most interesting questions which can be raised in respect to the surface of a region is the height of its culminating peak; and although as a geographical fact this may be far less significant than the mean height

of the mountain range, and as this again is subordinate in a commercial aspect to the height of the lowest passes across a mountain range, yet still popular interest on the one hand and scientific zeal on the other are often concentrated on the question which is the loftiest mountain. Let us then consider what new light the explorations of the last few years have thrown upon the highest summits of our own territory. For many years it was supposed that the loftiest peak in this country was among the Wind River Mountains, — a range which is crossed by the 100th meridian, and lies not far from the latitude of northern New York.

Such was the belief of Capt. Bonneville, the gallant explorer, whose expedition across the continent, in the year 1832 and subsequently, was so pleasantly narrated by Mr. Washington Irving, and whose maps are regarded by the best authorities as “the first to represent correctly the hydrography of the region west of the Rocky Mountains.” \* It may interest you to be reminded of Bonneville’s ascent of what he considered as not only the highest peak of the United States, but, as the highest peak of the North American, and which the Indians regarded as “the crest of the world.” Although his own language cannot be quoted, we have that of his accomplished historian, which, doubtless, tells us how the explorer ought to feel in finding himself on such an eminence. Having attained the summit, “a scene burst upon the view of Capt. Bonneville, that for a time astonished and overwhelmed him with its immensity. He stood, in fact, upon that dividing ridge which Indians regard as the crest of the world ; and, on each side of which, the landscape may be said to decline to the two cardinal oceans of the globe. Whichever way he turned his eye, it was confounded by the vastness and variety of objects. Beneath him, the Rocky Mountains seemed to open all their secret recesses ; deep, solemn valleys, treasured lakes, dreary passes, rugged defiles

\* Warren’s *Memoirs*.

and foaming torrents ; while beyond their savage precincts, the eye was lost in an almost immeasurable landscape, stretching on every side into dim and hazy distance, like the expanse of a summer's sea. Which ever way he looked, he beheld vast plains glimmering with reflected sunshine ; mighty streams wandering on their shining course toward either ocean ; and snowy mountains, chain beyond chain, and peak beyond peak, till they melted like clouds into the horizon. For a time, the Indian fable seemed realized ; he had attained that height from which the Blackfoot warrior, after death, first catches a view of the land of souls, and beholds the happy hunting grounds spread out below him, brightening with the abodes of the free and generous spirits. The Captain stood for a long while gazing upon the scene, lost in a crowd of vague and indefinite ideas and sensations. A long-drawn inspiration at length relieved him from this enthrallment of the mind, and he began to analyze the parts of this vast panorama."

Bonneville having with him no instruments for the measurement of altitude, is of course an indefinite authority, and it is but just to add that Irving did not accord with him in supposing this to be the highest point of the continent ; giving the pre-eminence to a more northern peak, then recently measured by Mr. Thompson, surveyor to the North-western Company.

The Rev. Samuel Parker, a missionary of the American Board, who went with Dr. Whitman and a party through the South Pass, in 1835, reported the highest peaks of the Rocky Mountains to be in that region, and said that "by measurement they were more than 18,000 feet high." (His narrative is not mentioned in Warren's Report. It was published in Ithaca, by the author, in 1838.) A decade had not passed from the time of Bonneville's ascent to the Wind River Mountains when Fremont, in the first of his famous expeditions, likewise attained their summit, with a kindred feeling of satisfaction that he had ascended

the loftiest altitude of the United States; and there are not a few of us who can remember with what glowing words he describes the peak which still perpetuates his name, and with what echoes of enthusiasm, during an exciting political campaign, his success was heralded on half the platforms from Maine to California. Let me quote his own words: "We had accomplished," he says, "an object of laudable ambition, and beyond the strict order of our instructions. We had climbed the loftiest peak of the Rocky Mountain, and looked down upon the snow a thousand feet below; and, standing where never human foot had stood before, felt the exultation of first explorers." His barometrical measurement of the peak gave a height of 13,570 feet above the Gulf of Mexico, a figure which has not been changed on our most recent maps. His biographer tells us that "having planted the flag of the Union on the topmost peak of the central mountains, and inscribed the symbol (of the cross), dear to all believing hearts, upon the mighty monumental rock at their base, he had fulfilled the holiest aspirations of patriotism and piety, and, as the explorer of the vast interior of North America, had pledged and consecrated it to Republican Freedom and Christian Civilization." Early within the present decade the mountain pre-eminence was transferred from the eastern border of the great west upheaval to the western. A barometrical measurement of Mt. Shasta, by Mr. W. S. Moses, gave the height as 13,905 feet; Fremont had previously estimated it at 15,000 feet, and Lieut. Williamson, of the Pacific railroad, at 18,000. In 1862, the Geological Survey of California, under Prof. J. D. Whitney, made a careful series of observations, which determined the summit to be at an elevation of 14,440 feet. In December of that year, Prof. Whitney discussed, before the California Academy of Natural Science, the question of the highest mountain of the United States, comparing the accurate measurement of Mt. Shasta, made under his directions, with the data

then at command respecting other peaks, and concluded that Shasta was "almost certainly" the highest point within the limits of the United States. Two years later Mt. Shasta, which had seemed to surpass the eastern summits, was compelled to bow its diminished head before a new aspirant for topographical pre-eminence, which was discovered in the south. Mr. Clarence King has the honor of being the discoverer, a young engineer but lately out of college, who had joined the survey of California as a volunteer assistant, and had accompanied the party surveying the "High Sierras." On the 6th of July, 1864, he ascended a peak which he had seen from Mt. Brewer, and found it over 14,000 feet. Here he saw two points of still greater altitude, and two of about equal altitude with that upon which he was standing, and to the mountain where he was he gave the name of Mt. Tyndall. But not yet satisfied, he made a brave effort to gain a still higher point. Once he was compelled to turn back; and again he made the attempt, but still the obstacles were too great for him, — but he had the satisfaction of gaining a point higher than any one had ever gained before within our territory. Let Prof. Whitney tell the story:

"The highest point reached by Mr. King in his efforts to scale the summit of Mt. Whitney was, according to the most reliable calculations, 14,740 feet above the sea-level. At the place where this observation was taken, he was, as near as he was able to estimate, between 300 and 400 feet lower than the culminating point of the mountain, which must therefore somewhat exceed 15,000 feet in height. So far as known, it is the highest point in the United States, and the elevation attained by Mr. King was greater than any other person has reached within our territories, or anywhere on the continent north of Popocatepetl.

"Mount Whitney is a ridge, having somewhat the outline of a helmet, the perpendicular face being turned

toward the east. There is snow on its summit, which indicates that there must be a flat surface there. The mountain is the culminating point of an immense pile of granite, which is cut almost to the centre by numerous steep and often almost vertical canons, ending in high walled amphitheaters. Southward of the main peak there is a range of sharp needles, four of which are over 14,000 feet high. The general aspect of the group is much like that of Mt. Tyndall. This mountain has been approached on all sides, except from the east, and found to be utterly inaccessible. Mr. King thinks it possible, however, that some route may yet be found by which the summit can be reached."

After speaking of the Cordilleras, the lecturer next referred to Alaska, especially to the volume of the Coast Survey pertaining thereto, and the researches of Dall, Kennicott and others. The other topics of the address were : (1.) The contributions which have been made to the historical geography of this country, with special reference to the work of the Maine Historical Society ; of the labored discussion of the same by Mr. Henry Stevens. (2.) Contributions to astronomy and mathematical geography, especially with reference to the new determinations of longitude. (3.) The hydrographic work of the Coast Survey, of the North Pacific exploring expedition, of the studies of various men of science upon the formation of our coast.

In conclusion, the lecturer dwelt briefly upon four points : (1.) The need of the National Topographical and Hydrographical Survey. (2.) The importance of scientific training for those who are going in any capacity to the new regions of the west. (3.) The legitimate work of "stay-at-home geographers," mountain clubs, etc., in the east ; and (4) the value of the American Geographical Society and Journal.



## II.

PHYSICAL GEOGRAPHY OF THE NORTH-WESTERN  
BOUNDARY OF THE UNITED STATES.

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BY GEORGE GIBBS. READ NOVEMBER 11, 1869.

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## PHYSICAL OUTLINES.

The principal divisions of Oregon, then comprising also what is now Washington Territory, were characterized by Mr. Dana, in his volume upon the Geology of the United States Exploring Expedition, chap. 17, as the Coast, Middle and Interior regions, separated from one another by the Cascade and the Blue Mountains; and the first again subdivided by the Coast range.

As this paper will be chiefly confined to that portion of the country lying north of the forty-sixth parallel, a somewhat different distribution may properly be made. I should distinguish the physical divisions of Washington Territory as the Coast region, subdivided as above; the Columbia basin, including the Yakama valley and the Spokane plateau, or, generally, that portion of the interior lying south of the forty-eighth parallel and west of the Bitter Root range; the region north of this last, which may be called that of the Upper Columbia; and, finally, the basin of the Upper Flathead and Kootenay rivers, lying between the Bitter Root and the Rocky Mountains.

## COAST OF THE PACIFIC.

The district immediately bordering the sea-shore is, in Oregon and Washington Territory, but a narrow strip, for the most part, of very broken country, resting against the western slope of the Coast range. It is indented by a



FRASER RIVER AT FORT YALE



number of bays, of which the estuary of the Columbia, Shoalwater bay and Gray's harbor are conspicuous. This border is but the remains of a district of whose former extent we have but little comprehension. The whole line of the Pacific exhibits, on a scale of unparalleled grandeur, the power of the ocean in its encroachment upon the land. Everywhere, one sees projecting promontories and rocky islets, pinnacles and columns, at a distance of miles from the shore; surviving witnesses of the force which for ages has thundered against its barriers, has undermined, thrown down, and finally comminuted its materials, and left behind but these isolated memorials of its progress.

But it is only when we contemplate the present shore, over an extent of many degrees of latitude, in connection with the evidences that geology presents of its former configurations, that the mind can compass the reality. From Cape Mendocino, in latitude  $40^{\circ} 30'$ , to Point Conception in  $34^{\circ} 30'$ , the coast mountains of California present a succession of parallel ranges, lying, as it were, *en échelon*, or overlapping one another, and including between them longitudinal valleys, such as those of the Rio Salinas of San Francisco Bay, Clear Lake, and of Russian and Eel rivers. Through this distance, the curves and indentations of the shore indicate encroachments to a great though unknown extent; but south of Point Conception the ocean has, in destroying the last landmarks, also left a determinate record of at least one step in its advance. Along the borders of Lower California, the Coast range has itself disappeared, and is now represented only in a group of islands, and, perhaps, one or two salient points of the peninsula, the rest having perished before the tireless assaults of the waves.\* So, to the north of Cape Mendocino, the whole Oregon shore, as far as Cape Flattery, has been eroded into one concave sweep;

\* Newberry, 9 vol. Rep. on the Colorado, p. 11.

and all but a single range of a once compound system carried away, from the forty-fourth to the forty-seventh parallel, or between the Umpqua and the Chihalis.

From the Strait of Fuca, northward, still greater changes are visible; though here, other forces have lent their aid to the modification of the shore. The line of the mainland is set back, as it were, to the eastward, more than two degrees of longitude; its trend again becomes more westerly, and instead of presenting an almost continuous line, numberless arms or fiords cut deep into the land. Where its bounds should have been, only a few islands mark its erosion, its subsidence or unequal upheaval.

It might have been supposed that so vast an amount of detritus as must have arisen from this continued erosion would have shoaled the neighboring sea; whereas, the Pacific, unlike the Atlantic ocean, deepens rapidly on leaving its immediate shore. The cause, I presume, to be in the prevalence of sub-marine currents, which have carried off the wash from the land and deposited it at a distance.

In conformity with this view are the statements of many who have navigated the North Pacific, that they have observed indications of soundings, at different points, from fifty to seventy-five miles from the shore; and the actual discovery, by the United States Coast Survey, of a bank, having not more than forty-two fathoms, at a distance of about forty miles off the mouth of the Umpqua.

The prevalent winds of the coast are, during the winter and spring months, from the south or south-east, through which seasons they are almost constant. Storms are most violent and frequent north of Cape Mendocino, and generally close with a heavy but short-lived gale from the south-west, which drives the swell of the Pacific in thunder against its shores. The size and force of the waves may be estimated by the fact that they *break* in thirteen fathoms water.\* In the summer and fall, on the

other hand, the winds are northerly and north-westerly, and, sweeping down the coast, produce an observable current to the southward, strengthened by the Japanese current, which is to the coast of America what the Gulf Stream is to that of Europe. The coast mountains throughout Oregon, and that portion of Washington Territory south of the Chihalis, are of comparatively insignificant height, but in the peninsula lying between Puget's Sound, the Straits of Fuca and the Pacific, they attain an altitude equal to that of the Cascades. This group, as it properly is, has received the name of the Olympic Mountains, from that bestowed by the voyager Meares upon some prominent peak, which, however, seems to be merely the culminating point of a mass of nearly equal altitude. Mr. Dana assigns to this, Mt. Olympus, a height of 8,000 feet; that of Mt. Constance, visible from Port Townshend, was ascertained by the Coast Survey at 7,777 feet. Snow lies on many of the summits through the year, but not in a continuous cap or covering. They are drained by a number of rapid streams running in immense ravines, and bringing down great quantities of water during their freshets. Very little is known of their interior topography or geology, but they probably resemble the opposite Cascade range. The group evidently at one geological epoch, that of the drift, has formed an island; and a subsidence which would cover the drift of the Puget's Sound country, say, of 300 feet, — would restore it to that condition.

#### BASINS OF THE WILLAMETTE AND PUGET'S SOUND.

Between the Coast range and the Cascades is a longitudinal depression, corresponding with the valleys of the Sacramento and San Joaquin, in California. This, in

\* There would seem to be a counter in-shore current, prevalent at least during the continuance of the south winds, as Vancouver mentions his having been set north of his supposed position. (Capt. Patterson, U. S. Coast Survey.)

Oregon, constitutes the valley of the Willamette, and in Washington Territory is continued through from the Columbia, forming the basin of Puget Sound, and finally sinks beneath the sea in the Gulf of Georgia and its northern prolongation. The portion of this valley lying upon the Columbia extends from a little above Fort Vancouver to the mouth of the Cowlitz; the river, turning suddenly northward at the former point, and subsequently resuming its westerly course. It is a strip fifty or sixty miles in length, and nowhere exceeding a few miles in width. The land lies generally in tables, a river level or interval, and a higher terrace behind it. The former is to a great extent overflowed during the freshets. It is of light alluvial soil, comparatively fertile and skirted along the banks with cottonwood. The higher tables are wooded with evergreens. North of the Columbia a subordinate basin is drained by the Chihalis, which cuts through the coast range into the Pacific.

The country bordering on what is usually called Puget's Sound, including under this appellation not merely the Sound proper, but Admiralty Inlet, Hood's Canal, and the various bays which open to the sea through the Straits of Fuca, together with that on a part of the Gulf of Georgia, is a slightly rolling table land, presenting generally steep bluffs to the water, and rising in benches to the height of 200 and 300 feet as it recedes from it. Excepting a few tracts of prairie, it is heavily timbered, the prevalent growth being of coniferous trees. A thick underwood accompanies these forests, which, in size of timber and rapidity of growth, remind one of the tropics. The mildness of the winters and the amount of rain which falls during a protracted season, rather than any unusual fertility of soil, furnishes the explanation.

A glance at the map of this region at once draws attention to the series of inlets referred to, which are remarkable, not merely from their ramification, but from their

great depth, their bold shores, and the steep and precipitous bluffs which almost everywhere rise from the water. The usual soundings may be stated at from forty to sixty fathoms; the latter being frequently exceeded, and the former often continued to the immediate vicinity of the bank. In these inlets, the tides are singularly complicated, and their height varies with the locality. While, for instance, at Port Townshend, the mean rise and fall is four to six feet, at Olympia it reaches twenty-two feet.

The rivers emptying into the sound, from the Cascade range, open at their mouths through narrow alluvial bottoms, bordered by bluffs like those lining the inlets. They are, as might be supposed, rapid and tortuous; subject to heavy and sudden freshets, from excessive winter rains, and they necessarily bring down great quantities of earthy detritus as well as of timber. The accumulations of this last, form rafts at different points, which from time to time are swept out and lodge on the shoals at their mouths, or are stranded along the shores of the sound. Most of the rivers have small deltas, and their deposits are gradually filling up or shoaling the bays into which they empty. Of the numerous waterfalls, the finest is that of the Snoqualmoo, a branch of the Srohomish river, which, emerging from the mountains, makes an unbroken leap of 275 feet, the width of the stream being one hundred. Lakes are scattered abundantly through this country, of which Dwamish lake, near Seattle, and Whatcom lake, having its outlet in Bellingham bay, are the largest. The latter appears to occupy a fissure between the tertiary sandstones and the metamorphic rocks.

#### CASCADE RANGE.

This chain is a continuation of the Sierra Nevada, though a chasm occurs at the passage of the Klamath; but the two portions occupy the same relative positions to the coast, and to the valleys which intervene between



them and the Coast range, and evidently follow the same general fissure. Through the length of Oregon and Washington Territory, the Cascade range runs north and south, parallel to, and at a distance of about 130 miles from, the shore of the Pacific. Near the forty-ninth parallel, it deflects north-westerly, in conformity to the new trend of the coast, and is called, in British Columbia, the Marine range. Its general elevation may be stated at from 5,000 to 6,000 feet, above which the great volcanic peaks tower in isolated grandeur. The chain obtained its name, by no means an appropriate one, from the fact that the cascades of the Columbia occur at the passage of that river through it.

#### FORESTS.

In a country like the Coast and Cascade region, the density of forests and undergrowth prevents an accurate observation of the details of geology; both because the rocks are generally hidden from view, and travel is impossible, except by rivers or established trails. The luxuriance of the forest, especially when the depth of soil, and the abundance of moisture are favorable to vegetation, is but little affected by latitude to a point far north of the bounds of the survey. Everywhere one finds trees of magnificent size; alder, maple, cottonwood, thuja and spruce, where the ground is subject to occasional overflow, and firs on the higher benches and mountain sides. The yellow fir, *Abies Douglasii*, is the prevalent forest tree of the whole country from the Cascade range westward, exceeding in number all the rest combined. The cedar, or more properly *thuja* (*T. Gigantea*), is next in abundance, attaining its greatest size in the bottoms and other damp situations. Above the zone in which these flourish, the silver and balsam firs replace the forest of the lower country, and are seen rising amidst snows which melt only with the last of summer. Descending

eastward, pines and larches succeed, unknown to the Pacific declivity.

The undergrowth is more varied than the forest ; vine maples and willows, the dogwood, azalea, crab, salmon-berry and elder fill the lower bottoms, and the gualtheria or sallal, ceanothus, bear berry and wood fern, the drier forest country ; while on the small prairies and openings are spireas, roses and other shrubs ; mosses and lichens, as might be supposed, are abundant in this humid climate. They form a thick carpet on the ground, cushion the limbs of trees, and depend in festoons from the twigs. Of animal life there is but little visible in these woods, and their recesses are silent, except when the wind sweeps through them, or some old trunk falls, with the sound of distant thunder. Vast quantities of dead timber encumber the ground, either fallen by decay, upturned by wind, or hollowed out and undermined by fires. Some of them, mouldering away, add to the soil ; while in particular species, the wood is so indestructible that upon the yet solid trunks of fallen giants, trees of formidable size rear themselves, sending down on either side column-like roots. Vast tracts of forest land have been swept by fires, springing perhaps from the smouldering ashes of some Indian hunting camp, or intentionally started to create a growth of berries. In the neighborhood of one of these conflagrations the dull sound of falling timber echoes at night like the discharge of minute guns. No sight can be more desolate than the newly charred woods. As far as the eye can reach successive ranges of hills are covered with blackened trunks, stripped of their foliage and branches, but still erect and tapering like a forest of needles.

The general prevalence of coniferæ, with their dark foliage, gives, especially at a distance, a somber monotony to the scenery of the north Pacific coast. This is, however, in some measure, relieved along the banks of the rivers by the lighter colored masses of the cottonwood

and alder ; and in the narrow bottoms, by the feathery sprays of the vine maple and dogwood, and the broad flakes of the azalea. The vivid colors of Atlantic forests are here wanting in autumn ; still, for the artist, the country presents infinite attractions, not only in the grand features of its scenery, the snow peaks which rear themselves above the Cascades, and the tremendous defiles of the rivers, but in the study of minute details, the many colored stains of lichens on the rocks and trees, and the lights glancing through the forest upon the undergrowth below.

#### INTERIOR REGION.

Between the Cascade and Rocky Mountains lies the region drained by the Columbia and its branches, divisible as above mentioned, so far as Washington Territory is concerned, into three sections, each having its own characteristics. From the great bend of the Columbia, in latitude forty-eight-degrees, southward to Lewis' fork on the Snake river, is a district elevated about 1,000 feet above the level of those streams, and known as the Plateau of the Spokanes and Nez-Perces — Indian tribes in whose country it lies. Connected with it in geographical position, as well as in geological structure, is that lying to the west between the Columbia and the Cascade range, and drained by the Yakama river.

It is only in these that the term "Basin of the Columbia" has any other than a hydrographical sense. Here the whole face of the country has changed. Instead of the forest which envelopes the coast and mountain regions, broad and arid plains covered with artemesias, or hills clothed only with bunch grass, extend in every direction. The surface of the country is scarred with canons ; the rivers are walled with basaltic cliffs, and the universal aspect is one of barrenness and desolation.

Some small valleys, principally along the foot of the mountains, alone afford spots suitable for cultivation. Of

the rest, however, much is adapted to grazing, and is pastured by droves of cattle and Indian horses. Above the forty-eighth parallel, a series of ranges, having a general direction of north and south, extends from the Cascades to the Rocky Mountains, and this condition applies equally to the adjoining portion of British America.

For reasons presently to be explained, the eastern part of this region, that lying beyond the Bitter Root Mountains and their northerly continuation, is here regarded as a separate district. The mountains which occupy the section of country so restricted, are, at least in Washington Territory, undistinguished by prominent peaks or striking outlines. They present a pretty uniform height of from 5,000 to 6,000 feet; are timbered, and with a more varied forest than that of the Coast region; the larch and several species of pine mingling with the firs, while the thuja is, for the most part, confined to the gorges of small streams, and is not conspicuous for size. Indeed, except the larch and red pine, *pinus ponderosa*, the timber is smaller than toward the sea coast.

Conforming to the direction of the mountain ranges, the rivers of this district pursue, for the most part, a course singularly direct and parallel; their valleys are little more than troughs, and the land capable of settlement is confined to small and isolated spots. A remarkable feature is the number and length of the fluvial lakes, of which those on the Okinahane and the Columbia are striking examples.

Glancing at the map of Washington Territory, it will be seen that, at the 114th parallel meridian, a little south of the forty-sixth parallel, the watershed of the Rocky Mountains is suddenly shifted over two degrees of longitude to the east; and that, while its former course is continued in a direction nearly north-west by the Bitter Root range, a longitudinal basin, drained by the sources of Clarke's Fork, the Kootenay and the Columbia, has

been gained to the Pacific slope by the division. The geological character and many topographical features of this last district are widely different from that adjoining it on the west, and indicate that the Bitter Root Mountains are the true axis of the system.

Like the other, this section is generally wooded, but its valleys are wider ; it contains some prairies, and, at least in the southern part, it presents, notwithstanding its elevation, far greater attractions for settlement.

#### CLIMATE.

As might be supposed, in this great region, traversed by mountain chains of such extent and elevation, the varieties of climate are extreme. The vapors of the Pacific, arrested first by the Coast range, descend in light but frequent rains upon the strip which borders the ocean, and the quantity of water that falls during the year reaches sixty inches. Snow is rarely seen, and remains but a day or two at farthest. The prevalent winds of winter, as before stated, are from the south, and, sweeping over so great an expanse of water, come laden with moisture, but of mild and equable temperature. The same fact exists, to a somewhat less extent, in the basins of the Willamette and Puget sound. The southerly winds draw through the river valleys, from November till late in the spring, and moderate the temperature, which the vicinity of so high a mountain range would otherwise render severe. It is rarely that snow falls more than once in a winter, or remains longer than ten days or a fortnight. The duration of cold is generally about the same, and is produced by winds from the north. The ground is never sufficiently frozen to injure grain. The Columbia river is occasionally closed by ice for a few days, between the Cascades and the Willamette, but this originates, in the first place, in drift-ice from above, which becomes compacted and frozen together. During the spring months, rain continues to fall, but, from

July until the end of October, it is rare. Thunder is seldom heard, and thunder-showers, such as occur on the Atlantic, are unknown. Thunder, in fact, when it does occur, is most common in the winter season. The nights are cool throughout the entire summer.

East of the Cascade range, the climate varies greatly with the locality. As a general thing, the summer is a continuous dry season, and the winters are far colder than in the western section; snow taking the place of rain, over most of the country. Around Walla Walla, the temperature does not differ, materially, from that of the Willamette, but on the Spokane plain, immediately north of it, the cold is intense and snow lies until late in the spring. Here, as well as on the Yakama, the Indians drive their cattle and horses to some sheltered valley, to winter. In the mountainous country northward, as well as in the eastern basin, the winters are, likewise, severe, and the snows of considerable depth. The summers are warm and without rain, excepting in the district between the Bitter Root and Rocky Mountains, where showers are of more frequent occurrence and are often accompanied by thunder.

#### EFFECT OF RAINS ON THE RIVERS.

As in intertropical climates, the seasons of this country, more especially its coast section, are divided into wet and dry. The rise of the rivers, necessarily corresponding with the source from which their waters are supplied, those of the coast, is suddenly and violently affected by the winter rains. Where, as in the valleys of the Willamette, the Sacramento and San Joaquin, the drainage from the level surface of the country is inadequate to carry off the floods which pour down from the mountains, vast lakes are formed, and, in unusually wet seasons, the whole bottom becomes submerged. The disasters which have frequently overtaken the town of Sacramento are well known. During the winter of 1862, the basin of the

river, from which it takes its name, presented one sheet of water from mountain to mountain. Cattle, horses, buildings, and even men, have been swept away. Similar disasters have, at times, befallen the inhabitants of the Willamette. Even in other streams, where the descent is more rapid, but where the channels are narrow or canoned, the rise of water is extraordinary. The Klamath, in northern California, is said to have risen one hundred feet in perpendicular height, and the Willamette, at Oregon City, must have reached at least sixty feet. All these streams receive their water from the western side of the Sierra Nevada and Cascades, and from the Coast Mountains; the Klamath alone, even taking its source to the east. On the other hand, the floods of the great rivers Fraser's and the Columbia occur in the summer, and are occasioned not by rains, but by the melting of snows in the far distant range of the Rocky Mountains.

The body of water brought down by them, during the three or four months which elapse between their first rise in May and their subsidence in the fall, is enormous. At Fort Vancouver, where the river is a mile in width at its ordinary stage, the freshet of the Columbia reaches nineteen or twenty feet; overflowing the whole extent of flat country in addition, and the effect of the tides is lost in the resistless current which sweeps oceanward, so that the water, even on the bar of the Columbia, is drinkable, and vessels can fill at Astoria. Were the freshets of this river and the Willamette to occur together, the valley of the latter would be uninhabitable, for the flood of the Columbia, as it is, backs up the water of the Willamette so that vessels of considerable draught pass the rapids, and reach the foot of the falls at Oregon City.







FERGUSON, ALBANY.

COLUMBIA RIVER ABOVE THE DALLES.

## FALL OF THE RIVERS.

A sufficient number of observations have not been made to determine with nicety the fall of these rivers in different parts of their course. The height of Kootenay above the sea, where the 49th parallel first crosses it, is approximately 2,250 feet, and at the second or westerly crossing, 1,850 feet, being a descent of 400 feet in 126 miles, or an average of three feet two inches per mile. Of this distance the first thirty miles is over a gravelly bottom, with frequent ripples, and the last twenty-five or thirty miles, between Chelemta and the parallel, is deep and sluggish, with a bed of silt. The intermediate portion is rocky. The elevation of the river at the mouth was not ascertained, but that of the Columbia on the parallel, about twenty-five miles below, is 1,290 feet; the total distance being 120 miles, giving a fall of 560 feet, or four feet six inches to the mile. Of this last distance, however, about twenty miles is sluggish water, and thirty miles is occupied by the Flatbow Lake, the greater part of the fall being within a distance of forty-six miles between the lake and the entrance of the river into the Columbia. The height of the Flathead or Okinesahtl at the parallel is 3,700 feet; at the Sinyakwateen crossing, 300 miles below, it is 2,140 feet, giving an average descent of five feet to the mile, including the Flathead Lake, twenty-four miles in length, and a like distance between the eastern end of the Kalispelm Lake and the crossing. Thence to the Columbia at the parallel, about 100 miles, the fall is 840 feet, or eight feet four inches to the mile. The greater part of this last is over a rocky bed.

The elevation of the Columbia at Fort Colville is 1,179 feet, and the difference between that point and the parallel, thirty-three miles, is 111 feet, giving about three feet three inches to the mile. From Colville to the foot of the Cascades, at which latter point the influence of the tides is felt, is about 600 miles, giving a descent of nearly two

feet to the mile, including fifty miles of sluggish water between the Dalles and the Cascades. The bed of the river, throughout, is of rock, and its course is broken by numerous rapids, besides two falls of some altitude. The fall of some of the lesser streams is much greater. That of the Similkameen, for instance, between the upper forks and the mouth, 121 miles, averages twenty-eight feet per mile; of the Nehoialpikwu, from the crossing of the Schaiuks to its entrance into the Columbia, eighty-three miles, eighteen feet; and of the Spokane, from the Cœur d'Alene lake down, ninety-five miles, fourteen feet.

Such are the prominent physical traits of this extensive territory. The influence which they are destined to produce upon future population is one of the most interesting problems which the settlement of the west offers to us. They have exhibited themselves already upon a savage race, now rapidly vanishing, in making of one tribe fishermen, of another hunters, of a third diggers of roots and devourers of vermin; in making these sedentary and aquatic, and those nomads. How far will they affect the successors of the Indian? Not only is geography the result of geological action, but often civilization is also. Certainly the habits, the resources, and much of the personal character of mankind are affected by the face of the country which they inhabit, and nowhere is this result more sure than among the scattered valleys of the Bitter Root and Rocky Mountains.

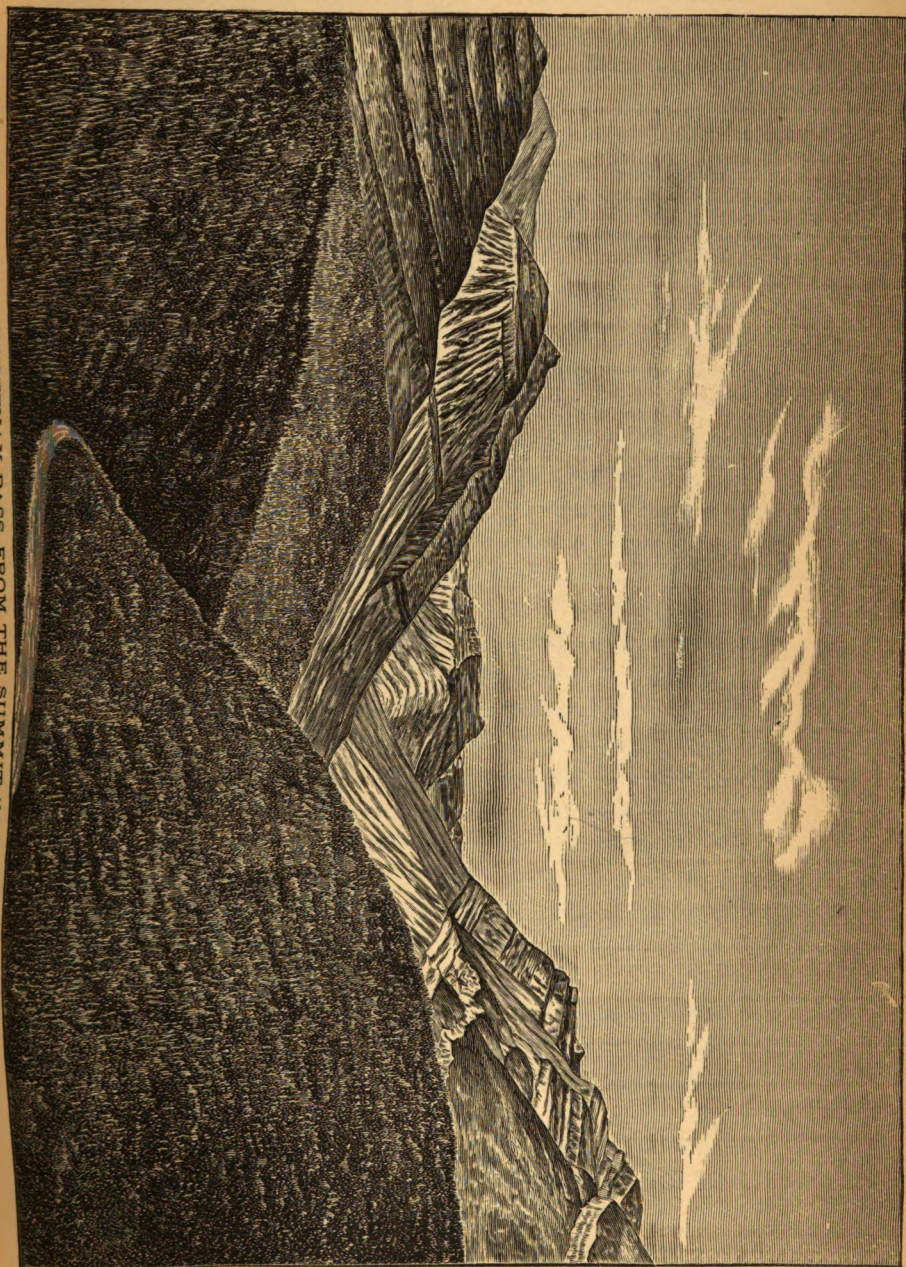
#### MOUNTAIN AND RIVER SYSTEMS.

The mountain and river systems of this region need a somewhat more extended development than has been given above, and may form properly the subject of a separate notice.

From within a short distance of the Gulf of Georgia to the eastern base of the Rocky Mountains, on the parallel of forty-nine degrees, the whole country is mountainous. No plains of any extent spread out; no broad valleys



KOOTENAY PASS FROM THE SUMMIT (looking east.)



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intervene to break the seemingly endless succession of chains, of ranges and of peaks. It may well be supposed, therefore, that where nature has worked on so colossal a scale, inferior parts of this grand whole are in themselves too vast for us to appreciate their comparative insignificance. While a great mountain range may have taken, as a whole, a distinct and well defined course, or while a system of ranges may possess certain absolute relations, such as that of parallelism, it may well be, as it here is, that extensive ridges and secondary divides run in almost every conceivable direction, perhaps radiating from some nucleus, forming groups around a center of upheaval, or starting as spurs from other ranges, and then again being broken and cut up in various directions by the irregularities of the original upheaving force, different resistance, or subsequently by the action of the elements, and thus all apparent order is lost. So, too, main ranges shift from one line to another, the fissure upon which they run being interrupted; and again different ranges coalesce and become single or anastomose, in such manner that the general direction is hardly traceable. Here and there landmarks present themselves either in a row of peaks, rising on uniform lines, or a succession of passes indicating the position of a water-shed; but this is far from being a common occurrence, and the attempt to follow any particular one, in a number of ranges, must often be based in part upon conjecture. It is to the hydrography of this country that we must look for the key to its mountains.

The number and size of the rivers and their remarkably similar character and direction, indicating the operation of uniform laws, at once attracts attention upon the map of North-western America.

In giving my own views of the systems which intervene between the coast and the Rocky Mountains, it is proper to state that it is only approximate, and that a far greater accumulation of facts is requisite before they can be

adopted as ultimate. Still I am not without confidence that the general results deduced are correct.

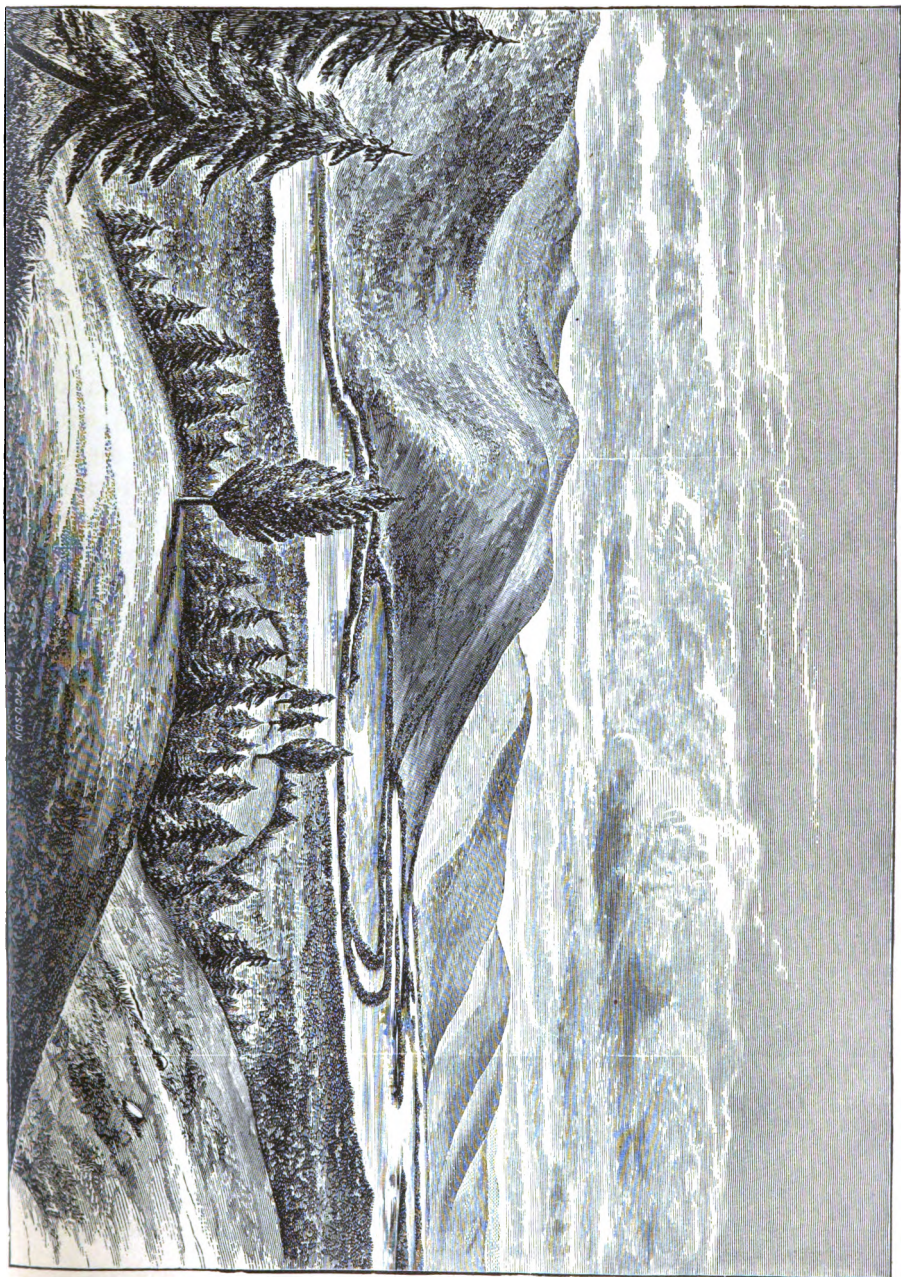
### RIVERS.

The head waters of the Columbia, the Kootenay and the Flathead, or north branch of Clarke's fork, rise in the eastern Rocky Mountain ranges, overlapping one another, and the Columbia pursuing a directly opposite course to the others, its source being in Otter Lake, in latitude  $50^{\circ} 15'$ , whence it runs north-west to about  $52^{\circ} 5'$ , while the others run south-east and south.

At the junction of its most northerly branch, Canoe river, which rises in about  $52^{\circ} 40'$  and interlocks with the head waters of Fraser river, the Columbia bends south, preserving this course with but inconsiderable deviations to the entrance of the Spokane in latitude  $48^{\circ}$ . It there turns west along the northern border of the Central Plateau to the mouth of the Okinakane, about a degree and a half of longitude, and again south, though less directly, till it reaches the forty-sixth degree of latitude, where it resumes a westerly direction to the mouth of the Willamette, breaking meanwhile through the Cascade range. On reaching, at this point, the depression which lies between the Cascade and Coast Mountains, it is deflected northward for nearly half a degree, and finally turns once more westward to the sea.

The Kootenay and Clarke's Fork, after escaping from the troughs of the eastern Rocky Mountain ranges, each apparently follow a general north-west course to their entrance into the Columbia, but really with considerable and very angular deflections, westward or northward, as they either successively break through ranges or run in their troughs (as will be seen in chapter VI). The valleys running north and south connect them even at these points. The Bitter Root or south branch of Clarke's Fork, heading a little below the forty-sixth parallel, runs due north to the entrance of the united Blackfoot and





KOOTENAY VALLEY FROM NEAR ARLEW CACHE.





Hellgate rivers, where it makes a deep westerly bend before joining with the Flathead. The course of the Okinakane is entirely parallel with that of the Columbia between the same latitudes, or nearly due south.

As regards the Snake river, though it partially agrees with the others, the geological and topographical features of the country through which it runs during a great part of its course, are entirely different, and a strict concordance could not be looked for. Thus from Fort Hall to where it strikes the foot of the Blue Mountains, near Fort Boiseé, it sweeps westward in a curve, through the great volcanic desert, a distance of four degrees of longitude; but on meeting with that range it turns north, and in conformity with it, finally breaking through westerly to join the Columbia. The Salmon river, its principal fork, also runs westerly for some four degrees, but most of its branches appear to run from south to north. The Des Chutes, which drains the eastern base of the Cascades, south of the Columbia, likewise follows that direction.

Even of the affluents of these various rivers, the greater part of those which have been accurately surveyed exhibit a north or south course, varied by sudden and shorter westerly or easterly deviations.

Fraser river presents these features even more distinctly. Heading in the Rocky Mountains in latitude  $52^{\circ} 40'$ , it runs north-west, conformably with the chain, to about  $53^{\circ} 35'$ , when it turns and runs south to Fort Hope, in latitude  $49^{\circ} 20'$ , and then west to the Gulf of Géorgia. Its north fork, Stuart river, rises in latitude fifty-six, and trends a little east of south to the fifty-fourth parallel, when it turns east to its entrance into the main stream. Thompson river, the main branch of Fraser, taking its course near the fifty-third degree, is at first deflected to the south-east, then runs south to Fort Kamloops in  $51^{\circ} 40'$ , and thence west, and again southerly to its junction.

It thus appears that, excepting Salmon river, the Snake, and some others of the volcanic plateau, all the large

streams of both the Columbia and Fraser rivers basins, and many even of the secondary ones, run in troughs between parallel ranges of mountains, those of the Rocky Mountain system having a conformable course, north-west or south-east ; and those intermediate between that and the Cascades, north or south ; and that, in seeking an outlet to the ocean, they transfer themselves westward, from one trough to another, by cutting through these ranges nearly at right angles. The only exceptions to this, I believe, occur where the ranges deviate to the westward, in which case the rivers generally cut through them diagonally.

Fraser river and the Columbia, both heading in the Rocky Mountains, in this manner cut, one after another, every range between them and the Pacific. Thompson river, in the same way divides the mountains from the western Columbia range to Fraser river ; and their various branches shift from one trough to another before reaching an outlet.

The Skagit river alone cuts the main chain of the Cascades as the Klamath and Sacramento do the Sierra Nevada.

The Columbia, in its bend between the Spokane and the Okinakane, does not, it may be observed, cut through a range, but follows the line separating the volcanic rocks of the plateau from the granitic and metamorphic formation of the central range of the Cascades. The same is the fact with the Spokane river, which runs westward from the Cœur d'Alène lake into it. The observation, sometimes regarded as of universal application, that great deflections in the course of rivers indicate a change in the geology of the country, though true in this instance, cannot be regarded as of even ordinary application in respect to this system of waters.

A noticeable peculiarity in the hydrography of this region is, that the divide at the sources of many of the streams which head with one another, and run in opposite directions, is so low that a trifling erosion would con-





SUMMIT OF MOUNT HOOD, SHOWING THE CRATER, FROM THE EMIGRANT TRAIL.

neot them, and that numerous valleys, filled only with drift, modified, such as those between the Kootenay and Clarke's Fork, and between the latter and the Spokane, indicate that, at a former period, communications in continuance of their north and south courses, existed between rivers now diverted in other directions. It is to the peculiar direction of the mountain chains, as Mr. Dana has justly noticed, that these rivers owe their length and magnificent size. Thus the Columbia, including the Snake, drains a region extending from the forty-second to the fifty-second parallel of latitude, and Fraser river, from the forty-ninth to the fifty-sixth, the former having a length, exclusive of its branches or minor wanderings, of over twelve hundred English miles, and the latter of over seven hundred.

Of the principal branches of the Columbia, the Kootenay is over 400 miles long, the Flathead, taking the north fork, 450, and the Snake, 700 miles.

#### MOUNTAIN CHAINS.

As to the Coast range, it is unnecessary to add to what has been already observed. The western or true Cascades are in themselves so far a coast range that they follow its general trend, however distant it may now be.

Where the shore of the Pacific, from Cape Mendocino to the Straits of Fuca, follows generally the meridian, the Cascade Mountains conform to it, and where, in the latitude of the Straits ( $48^{\circ} 30'$ ), or, more correctly, at the southern end of the Gulf of Georgia, about latitude  $49^{\circ}$ , the coast takes up its north-westerly direction, a similar bend occurs in the Cascade chain. Thus, instead of ultimately coalescing with the Rocky Mountains, as otherwise they would have done, the Cascades, north of that point, run nearly parallel with them. There is, however, a broad mountain range, apparently belonging to the same system, which follows a different course.

I have taken the Okinikane river and lakes as the eastern limits of the Cascade Mountains, not only because they present the most direct prolongation of the lower Columbia, but because their valley is the lowest drain of all the streams between the Cascade and Rocky Mountains.

Starting with this assumption, it would seem that the Cascades, which to the southward are a single range, separate about the latitude of the Winatsha; and that, while the western or main branch continues on northward, crossing the Skagit, the other runs to the east of it, forming the divide between that river, on the one hand, and the Columbia and the Okinikane on the other.

Some question has been raised as to which of the ranges north of Fraser river constitutes the true continuation of the Cascades. Opposite to Fort Langley, one of them terminates in a bold butte, between the peaks of which lies a small glacier, and this appears upon the English maps as the main marine chain, Mt. Baker being delineated as in the same range to the south of the river. It will, however, elsewhere be seen that Mt. Baker is situated upon a spur, far to the west of the watershed; and it appears to me that the ranges west of Harrison lake, of which there seem to be three, are flanking ranges, which start from the river, and are not represented south of it, but that the one which divides Harrison lake from the upper Fraser, and is cut through by the river at Fort Yale, is the proper continuation of the Cascade chain. These flanking ranges, however, seem to equal the others in height, the peaks of all of them rising into the region of perpetual snow.

To return to the other branch of the Cascade range — that east of the Skagit. The watershed, though very irregular, lies much nearer to that river than to the Okinakane. In fact, the main Similkameen river and the west branch of the Pasayten, its principal fork, both head close to the Skagit itself. South of the forty-ninth

parallel, this range is elevated and broken, having many peaks as high as the western Cascades; while north of it the ridges present a more uniform height. It has here much less the character of a range than that to the west, but is rather an assemblage of ridges extending over a degree and a half of longitude without traceable parallelism. Near the forty-ninth degree, these mountains again split into two by the valley of the Similkameen, and I have accordingly distinguished them on the profile as the Skagit of Similkameen ranges. Between Fraser and Thompson rivers, they are said to subside into a very elevated table-land.

East of the Okinakane is another range of mountains, which, though differing greatly from them in form and geological structure, rise to an equal average height with the Cascades, but which appear not to belong either to those on the Rocky Mountains. They line the Columbia river on the west, having a general north and south course to about the fifty-first parallel, where they also turn to west of north, forming the divide between the waters of the Columbia and those of Thompson river. This range was conjectured by Mr. Dana, and on apparently just grounds, to be the equivalent of the Blue Mountains of Oregon, and to bear the same relation to the Columbia that those do to the Snake river.

It is this one which I have denominated the Central range.

The direction of the ranges, between the Columbia river and the Rocky Mountains, is somewhat more obscure, owing, in part, to the deficiency hitherto of accurate topography. The explorations of the Commission will, however, elucidate that in the immediate neighborhood of the parallel.

The range generally represented as continuously bounding Clarke's Fork on the south-east, from the Columbia river to above Kalespelm lake, has no existence as such. On the contrary, the trend of the mountains appears to





Gulf of Georgia, as far as Nanaimo; as also of the Skagit river to its canon; of the Nooksahk, and of Fraser river to Fort Yale. The route of the Survey eastward was by the Chiloweynek, an affluent of Fraser river, over the Chuchchehum pass of the Cascade range to the upper waters of the Skagit; thence, crossing the divide between the waters of Puget Sound and those of the Columbia, along the southern branches of the Similkamen, to the junction of that river and the Okinikane, and by way of the Nechoalpikwu to the Columbia.

From Fort Colville, a detour was made south to the Spokane, in order to avoid the mountains intervening between the Columbia and Clarke's Fork, and thence north, crossing the latter below the Kalispelm lake, and striking the Kootenay at Chelemta.

Following the right bank of the Kootenay down to the neighborhood of the parallel, the route next struck eastward to the Mooiye, one of its tributaries, which was pursued to its source in about latitude  $49^{\circ} 30'$ , and thence again to the Kootenay, following it down to the second crossing of the parallel. Thence the pass of the Akonoho, or Tobacco river, was taken over the range between the Kootenay and Akinesahtl, or Flathead, to the latter stream, and the Kishenehn pass across the divide of the Rocky Mountains to the waters of the Saskatchewan. Returning, the Kootenay was followed down to the Chelemta, crossing and recrossing, and the former route retraced to the Spokane ferry. Finally the Spokane plateau was traversed to Walla Walla, and the Columbia river descended to its mouth. Various side expeditions and reconnoissances were made from time to time by different members of the party, in addition.

## III.

## THE YUKON RIVER REGION, ALASKA.

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BY CAPT. CHAS. W. RAYMOND,

United States Corps of Topographical Engineers

Read 12th of April, 1870.

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MR. PRESIDENT, LADIES AND GENTLEMEN : I propose to give, in the present paper, a brief account of a journey which it was my fortune to make, in the year 1869, through a portion of the territory of Alaska. It was undertaken under the orders of the Commanding General of the Military Division of the Pacific. That officer had been informed that early in the season a sailing vessel would be dispatched from San Francisco for St. Michael's Island, in Norton's Sound, carrying upon its deck a small steamer, which was to try its fortunes upon the waters of the great Kvichpak or Yukon river. This steamer was to collect on its way the furs of the adjacent country, and attempt to reach the mouth of the Porcupine or Rat river, near which the Hudson Bay Company had established its most western trading station, Fort Yukon.

The object of my expedition was, primarily, to ascertain by astronomical observation whether Fort Yukon is within the territory of the United States, and, secondly, to collect as much information as practicable concerning the country, its resources, trade and inhabitants.

Having made such hasty preparations as were practicable, before the departure of the vessel, I sailed on the brig Commodore, from the harbor of San Francisco, accompanied by my assistant, Mr. John J. Major, on the 6th day of April, 1869.

Traveling by way of Sitka and Ounalaska, at each of

which places we stopped several weeks, we finally anchored, on the 29th day of June, off the "Redoubt," on St. Michael's Island.

I shall confine myself, in this paper, principally to an account of our expedition from this point to Fort Yukon. It is true that I pass over some of the most interesting points which we visited in Alaska, but my opportunities for observation, at these places, were so limited in comparison with those of many other observers (the opinions of some of whom are entitled to the greatest respect), that I feel certain that I could make no addition to your knowledge, either by an account of what I saw, or by the opinions which I formed. The southern portions of Alaska have been comparatively well examined, while there have been very few explorers in the northern parts. I shall, however, before concluding, indulge myself in a few remarks concerning the territory generally.

Before entering upon an account of my own experiences, it will be well to mention, briefly, the sources of information which we have heretofore possessed, concerning this portion of the country.

The coast of Russian America, and the islands of the Atlantic Archipelago, have been well examined by both Russian and English navigators. The interior of the country is, however, comparatively unknown. In the year 1842, Lieut. Zagoskin, of the Russian navy, visited the region of the Kvichpak river, and, under the direction of the Russian government, made extensive explorations, remaining in the country about two years. He afterwards published a book, which I believe has been translated into German, giving the results of his observations. This book I have not been able to obtain, and consequently the little I have gathered concerning his explorations has been derived entirely from secondary sources. He traveled from the mouth of the Kvichpak river to a point a little above Nulabo, the most eastern post of the Russian Company, a distance from the sea of about six hun-

dred miles. His book was almost the only authority concerning the Kvichpak river until, in the year 1865, the Western Union Telegraph Company commenced its explorations for an overland telegraph route, which by a cable crossing Behring Straits was to connect the eastern and western hemisphere.

This enterprising company employed several hundred explorers on both sides of the Pacific; and their explorations in the northern part of Russian America have added greatly to our knowledge of this part of the continent.

To Messrs. Ketchum and Labarge, employés of this company, belongs the honor of having made, in the summer of the year 1866, the first trip by way of the Kvichpak from the coast to Fort Yukon.\* Up to this time, the Yukon river of the English and the Kvichpak river of the Russians had been supposed to be distinct streams; and they are represented on quite recent maps, the one emptying into the Arctic Ocean and the other into Norton's Sound. The exploration of Ketchum and Labarge first proved them to be one and the same stream.

In the winter of 1866-7, these adventurous travelers again made their way on the ice to Fort Yukon, and in the following summer pushed on to Fort Selkirk, a point more than six hundred miles farther up the river, and I believe the point nearest the head-waters which has yet been reached.

These gentlemen have published no account of their adventures. I have, however, had the pleasure of traveling a considerable distance on the Yukon river with Mr. Michael Labarge. Since the year 1866, he has been traveling constantly upon the river, and is probably more

\* I learn from Mr. Dall's admirable work on Alaska, published since the reading of this paper, that this honor belongs to Ivan Simonson Lukeen, an employé of the Russian Company at St. Michael's, who succeeded in reaching Fort Yukon in the summer of 1863. Mr. Dall says that "the information thus obtained was not made public."

conversant with its topography, and with the manners and customs of the native tribes which inhabit its banks, than any other living white man. I am indebted to Mr. Labarge for a large amount of valuable information which I could not otherwise have obtained.

The next expedition up the river to Fort Yukon was made by two officers of the Western Union Telegraph Company — Messrs. Frederick Whympers and William H. Dall — the former an artist who had had considerable experience in traveling in British Columbia; the latter a collector for the Smithsonian Institution. In the fall of 1866, these gentlemen crossed the portage from Unalaklut to Nulato, where they spent the winter, and started early in the spring of 1867 for Fort Yukon. Making their way with considerable difficulty in "baidarras" or skin boats, they finally reached their destination in the latter part of June, after traveling almost constantly, day and night, for twenty-nine days. They remained at Fort Yukon for about two weeks, and then, re-embarking in their light boats, they started down the river. Traveling night and day, and aided by the rapid current, they arrived at St. Michael's Island after a journey of fifteen days and a half, which Mr. Whympers terms a mere holiday excursion.

To this expedition we are indebted for a large amount of reliable information concerning the Yukon. In 1862, Mr. Whympers published his "Travels in Alaska and on the Yukon;" a book which adds to the charms of a pleasing style and excellent illustrations, from the hands of its author, the more solid advantage of perfect truthfulness.

In January, 1868, Mr. Dall published, in Silliman's Journal, some notes on the geology of the Yukon river region, which are extremely interesting and valuable, and I believe he is about to publish a book on Alaska, which will undoubtedly add still more to our knowledge of this region.

The island of St. Michael's is situated, according to Lieut. Zagoskin, in north latitude  $63^{\circ} 28'$ , and longitude  $161^{\circ} 44'$  west from Greenwich. It is about fifteen miles long and eight miles wide, and is separated by a narrow and shallow channel from the main land. While the Russian American Company occupied the country it was always a station of importance, being the principal post in Northern Alaska, and the depot of supplies for the stations on the Kvichpak river. There is no harbor at St. Michael's, but the island covers the anchorage from most of the prevailing winds. In order to reach from this point the most northern entrance to the Kvichpak river, a journey of about eighty miles must be made along the coast of Norton's Sound. But St. Michael's is the nearest anchorage to the river, the mouths of which, as far as explored, have been found too shallow even for the accommodation of vessels of small draft.

Like the coast hills, the island is principally composed of a porous volcanic rock. It has a rolling surface, covered with deep, coarse moss, and is destitute of trees or any other useful vegetation. All the wood used for fuel has to be brought from the mouths of the Kvichpak, whither it drifts from the interior.

The "Redoubt" is simply a collection of rough log buildings formed into a hollow square. It is flanked at two of its diagonally opposite corners by small towers. Outside the inclosure are two or three rough houses, put up by American traders since the transfer of the country to the United States, and a small, rude chapel belonging to the Greek church.

Our vessel lay about half a mile off the island, and scarcely had our anchor touched the bottom before we saw several boats approaching from the shore. They were the long, light "baidarras," or skin-boats, of the country, and were crowded with natives—men, women, children and dogs. The sight of a ship is not an unusual thing to the natives who frequent St. Michael's; but they

are as fond of novelty as children, and are still possessed of great curiosity regarding the manners and customs of the "Americanski." They scrambled upon our decks as if attempting to carry the vessel by storm. They seemed delighted to see us, and laughed and chatted gaily with several gentlemen who understood a little of their dialect. Many of them hung around the cabin begging for food, and they were delighted when supplied with a little salt meat and ship biscuit. Their proximity was, however, for various reasons, not pleasing to any of the senses; but they took our impoliteness in very good part when we made them leave the cabin.

By much feeding and a few little presents, we persuaded them to favor us with one of their dances. After a display of considerable bashfulness, they struck up a monotonous chant, accompanying themselves by beating upon pans, boards and any other suitable articles on which they could lay hands. A boy and two girls then took the floor and began to dance with a shuffling step, not very intricate in character, but, nevertheless, hard to describe. This performance was accompanied by a vigorous pantomime, illustrative of the various feelings which may animate the human breast. Now they would approach each other with wild gesticulations, as if inspired with the most frantic rage, and again they would seemingly endeavor to exhibit to their sympathizing audience the effects of an ardent but unfortunate attachment, giving vent to most doleful lamentations, and assuming an expression of heart-broken woe, touching in the extreme. When fatigue compelled the dancers to leave the floor, they were succeeded by others, who went through nearly the same performance, until finally we were glad to inform them that we had seen enough.

Before entering upon an account of our journey up the river, it may be well for me to give a brief description of these coast natives. The information which I have gathered concerning them, although meager, is quite



reliable, for it was obtained not only while making the preparations at St. Michael's for our inland journey, but also upon my return, while passing through a portion of the country which they occupy, during which time I lived among and traveled with them.

There is no permanent native settlement on St. Michael's Island. The natives belonging to the coast tribes often visit the redoubt for purposes of trade, but their various settlements are scattered along the mainland. There was, indeed, at the time of my visit, an Indian village on the island, which had an appearance of permanency, but I believe it is not occupied very long at a time by the same Indians.

The principal tribes which live along the coast of Norton's Sound, are the Kaveaks, the Malemutes, the Unalachluts and the Magamutes. The Kaveaks inhabit that portion of the sea-coast between Behring Straits and Sound Galovnia; the Malemutes are situated between the Sound and the Unalachlut river; the Unalachluts live at the mouth and along the banks of the river of that name, and the Magamutes are found from the Unalachlut river to the mouth of the Kvichpak.

These tribes often meet at St. Michael's, and consequently there is a great similarity in their language, customs, character and appearance. It is almost impossible to form an estimate of their numbers, as they continually travel up and down the coast, and are rarely met with in large parties. A Russian trader, of long experience, informs me that, in his opinion, they number about five thousand.

During the winter, these tribes live in their villages, trapping for skins in the vicinity, and making occasional trips to St. Michael's for trading purposes. In the summer they are more scattered, collecting stores of food for winter use. The Kaveaks and Malemutes, in their skin canoes, hunt the walrus and the hair seal, and, making their way into the valleys between the low coast

ranges, kill the reindeer in great numbers. The Unalachluts are engaged, during the summer, in fishing for the salmon, and the Magamutes seek the lower waters of the Kvichpak, for the same purpose.

These Indians have, in appearance, all the characteristics of the Mongolian type — a sallow, olive complexion; the hair straight and black, the forehead low and receding, the nose broad and short, the face beardless. They are generally of small stature; but there are among them many tall, well-built men. Most of them are vigorous and healthy, although they are subject to many of the diseases incident to reckless exposure. In all these respects, the Kaveaks and Malemutes are far superior to the other tribes, as might be expected from their more active and hazardous pursuits. Among the diseases which I found prevalent among them are consumption, rheumatism, colds, asthma and croup. Of the last-named disease, great numbers of their children die yearly.

The food of these Indians consists of fish — fresh and dried — reindeer meat, walrus, and seal meat and oil.

In summer, they travel on the rivers and along the coast in their bark and skin canoes. The birch-bark canoe is so well known that I need not pause to describe it here. The skin boats are of two kinds — the “baidark” and the “baidarra.” The “baidark” is a long, light, canoe-shaped boat, covered with the skin of the hair-seal. This covering extends over the whole top, except one, two or three holes, in which the travelers sit. The boat is propelled by the paddle, which, in the skillful hands of a native, gives it a tremendous speed. It requires great skill to manage these boats, as they are very easily capsized.

The “baidarra” is always much larger than the “baidark.” I saw some very large ones, capable of accommodating twenty or thirty persons. It is built exactly on the model of a birch-bark canoe — a strong wooden framework, pointed fore and aft, and covered with tough seal-

skin. Owing to its lightness and the ease with which it is managed, it is an admirable craft for river travel.

In the winter, the rivers still continue to be the great highways on which the natives travel with their dogs and sledges. After much acquaintance with and study of that interesting animal, the Esquimaux dog, I can say with confidence that he stands at the lowest point of the scale of comparative excellence of the canine species. He is mean, cowardly, quarrelsome and dirty. His vocabulary does not include a good, honest bark, but only a howl and a whine. In the matter of food, he is not in the least particular, either as regards quantity or quality. If provided with material, he will eat all day. If given nothing, he seems to thrive very well upon it; but in this case, boots should be hung very high at night, as he has a weakness for boots as an article of diet. He does not absolutely disdain other articles of clothing or domestic utility. The unfortunate cook of one expedition was driven to a state bordering upon distraction by the rapid disappearance of his dish-cloths—an article, the supply of which rarely equals the demand in northern regions.

A sledge-team usually consists of seven dogs, but sometimes as many as eleven are used. The odd dog is placed at the head of the team, and serves as a leader. An Indian always runs in front to show the way.

The Indians dry an immense amount of salmon, during the summer, for the winter dog-feed. This fish is found in great abundance in the waters of all the northern rivers.

The villages of these people contain from two or three to a dozen families, and are composed of rude, low houses, built of logs and covered with earth. The door is simply a small, round hole placed near the ground, so that it is impossible to enter except on the hands and knees. The fire is placed in the center of the building, and the smoke makes its way through a hole in the roof.

Their winter houses are completely under ground. Rude as these houses are, they are, nevertheless, tight and warm.

These Indians are very unclean in their habits, though much superior, in this respect, to the Kvichpak Indians, of whom I shall speak hereafter. Many of their habits are too disgusting even to be mentioned. They have no idea of comfort, few artificial wants, and consequently little industry. Such a thing as *virtue* is unknown among their women. They are all more or less acquainted with the use of intoxicating liquors, which they have been accustomed to obtain from American whalers along the coast. They do not, however, seem to use them to excess, for, while I was among them, I did not observe a single case of intoxication. Indeed, I am told that they often re-sold spirits to the Russians, among whom the use of intoxicating liquors was carried to a great excess.

Finally, these people are kind, peaceable, generous and hospitable. I had many opportunities of judging them in these respects, and am indebted to them for cheerful assistance on many different occasions.

These Indians all wear skin clothing, both in summer and in winter. The "parca" is a sort of long shirt of reindeer skin, the hair being worn outward in dry weather, and inward in wet. It has a hood attached, which forms a covering for the head, and which is usually trimmed with the "cacajou" or wolverine skin. In the summer they wear leggings and boots of reindeer skin, the latter having "moclock" or seal-skin soles. In the winter the boots are entirely of moclock, and are made with so much skill that they are completely watertight. The under lip is usually perforated under the corners of the mouth, and through these holes pieces of bone or bits of stone or metal are inserted. The women tattoo their chins in vertical parallel lines. These and the wolverine trimming are the only attempts at ornament that I noticed among these people.

The dress of the women so closely resembles that of the men, that it would be almost impossible to distinguish them, were it not for the tattooing before mentioned. The similarity is heightened by the facial resemblance of the sexes, characteristic of the Mongolian type.

Having thus briefly described the natives of the coast, I am prepared to give an account of our expedition up the river. On the 1st of July, our little steamer was successfully launched over the side of the "Commodore." The next two days were occupied with busy preparations. Two large barges, obtained at St. Michael's, were loaded with trading goods and the winter's provisions for the stations which were to be established on the river. Guns, pistols and all manner of defensive weapons were cleaned and burnished for deadly work; for, in common with most other intelligent citizens, we had perused the letters of certain individuals to the Honorable Secretary of State, and were convinced of the ferocious character of the people to whose tender mercies we were about to be exposed!

On the evening of the third, our preparations were all completed. At midnight we discharged, in honor of Independence Day, an old Russian cannon, obtained somewhere on the route, taking care to keep at a safe distance and use a very long string. Early on the morning of the "Glorious Fourth," the little Yukon puffed off with her string of barges, amid the cheers of the sailors, the dipping of flags and the firing of guns. We all felt that this commencement of our trip up the great river was an event of no little importance. Never before had a boat propelled by steam traveled on the inland waters of Northern Alaska. While engaged in their explorations, the Western Union Telegraph Company brought a small steamer to St. Michael's, but, owing to some failure in the machinery, it never was taken to the river. Whympers and Dall, during their journey, spread the report among the natives that a "fire-boat" was coming, and the news

had created great curiosity and excitement. It was pleasant to know that once in our lives we were sure of making a sensation!

Our party consisted of Capt. Benjamin Hall, commanding the steamer, Mr. Frederick M. Smith, superintendent of the company owning the steamer, Mr. John R. Forbes, engineer, Messrs. Westdahl and Labarge, traders, Mr. Lewis Parrott, of San Francisco, Mr. John J. Major, my assistant, and myself. Besides these there were three or four trappers and Private Michael Faley, Ninth United States Infantry, my "body-guard."

Our journey along the coast was altogether devoid of incident. At about three o'clock, in the afternoon, we arrived at the upper, or Aphoon mouth. This mouth is situated, approximately, in latitude  $63^{\circ} 10'$ , and longitude  $164^{\circ}$ . Steaming up against the current, which is not very strong, we reached the great Yukon itself, after a journey of ten hours. The Aphoon outlet is some forty miles in length, and has an average width of about one-third of a mile. Its banks are low and flat, and are covered with a chaparral of alder, willow and cottonwood. It is very shallow, and filled with sand-bars.

After leaving the Aphoon mouth, a journey of seven days brought us to Anvic, a point about three hundred and fifty miles above the sea, where we were to establish our first trading station. We traveled in a general direction about north-east magnetic. About sixty miles from the sea we passed Andreavski, a deserted trading station of the Russian Company, situated on the right (north) bank of the river. Up to this point the river banks continue flat and low, but here the right bank rises into hills. Here we noticed the appearance of a dark volcanic rock, and, a little above, bluffs of sandstone and slate. The river is very tortuous, and is filled with sand-shoals and islands. In this part of our voyage we passed many Indian villages, to some of which we made brief visits. The natives do not generally make permanent homes on

the banks of the Yukon, but build temporary fishing camps, which they inhabit during the summer. They are called the Primoski or Magamutes, and sometimes merely the Lower-Kvichpak Indians. I might spare you a description of these people by saying that they closely resemble the Coast Magamutes, except that they are dirtier, less energetic and more generally worthless. They live almost exclusively on fish, which they obtain from the river with little effort. I failed, however, to notice the intellectual development which, according to recent theories, should accompany this phosphoric diet. They seem to be totally devoid of ambition, energy or industry.

I cannot, however, pass by these unfortunate people without noticing an unfounded charge which has been made against them. I have seen in print an account of a journey on this part of the river, in which the barbarity and ferocity of the Lower-Kvichpak Indians are painted in glowing colors. Nothing could be further from the truth. A more inoffensive, harmless, obliging, pusillanimous, lamb-like race does not exist on the face of the globe. It is a pity that they should be charged with almost the only bad thing of which they cannot truthfully be accused. On the approach of our steamer to their villages, it was the custom of these bloodthirsty creatures to "take to" the woods, in which performance they displayed that amazing speed and activity for which the red man is so justly celebrated. They were usually accompanied by two or three dozen dogs, running at full speed, with tails very much depressed and howling lugubriously. On landing, we usually succeeded in getting within hearing of a few of them, and convincing them of our good-will by means of little presents; and, finally, they would gain courage and congregate on the shore near the steamer. But a vigorous "toot" on the whistle was usually sufficient to send them flying to the woods again.

We stopped at Anvic nearly two days, preparing

accommodations for the traders who were to remain there. It is a small Indian village, situated on the right bank of the Yukon and at the mouth of the Anvic river, an important northern territory.

The Indians who inhabit Anvic and the banks of the Anvic river, belong to the great Indian tribe which occupies the country from this point, along the banks of the Yukon and its tributaries, as far as Nulato. They very much resemble the Lower-Kvichpak Indians, although superior to them in some respects. They hunt moose, and seem to be a little more ambitious and energetic.

The village of Anvic may be described as a fair example of the more permanent Indian villages on the river. Along the shore, a fleet of bark and skin canoes is drawn up. Back of these, a number of rough frames are arranged in parallel rows, on which hang countless salmon, drying for winter use. Still further back are the houses, resembling those of the Malemutes, already described. On the left of the houses is a row of small huts, raised ten or twelve feet from the ground, on short poles. These are the *caches* in which furs and meat, obtained in hunting, are stored beyond the reach of wild animals, which may enter the village during the temporary absence of the inhabitants. On the left of the village is the dance-house, a log structure, somewhat larger and more commodious than the ordinary dwellings. The dance-house is of great social importance in every village. Here the people assemble during the winter nights, which I need not remind you contain very nearly twenty-four hours, and amuse themselves with singing, dancing and a variety of pastimes.

It is a remarkable fact that, although the Ingeletes and Lower-Kvichpak Indians have considerable intercourse, they speak entirely different languages, and are usually unable to understand each other. Even the ordinary smattering of a few words of foreign language, almost universally acquired by the inhabitants of an adjacent



region, seems to have been too great a task for their abilities.

There is no recognized form of government among them. The "staruk," or the oldest man of the village, exercises considerable authority, but as he has no means of enforcing his orders they are often disregarded. The people, however, are not quarrelsome, and they get along remarkably well without any restraining powers.

From Anvic to Nulato we traveled in a general direction about north-north-east, magnetic. The river averages about two miles in width. Without the assistance of the pencil it is impossible to represent this portion of the Yukon. Its numerous windings, its thousand islands, its bars and shoals, ever changing and shifting, baffling the traveler in his search for the channel, defy description. Generally speaking, the right bank is high, exhibiting many bluffs of sand and rock, formed by the ice-torrents in the spring. The left bank is low and level. Here and there, however, small hills are seen standing back a mile or two from the water, and a distant range of mountains, parallel to this shore, is visible almost all the way. In these mountains lie the sources of the great river Kuskokvine.

In this and many other parts of the Yukon a curious and rapid change is going on. In the spring the ice undermines the high banks, sometimes to a distance of thirty or forty feet. On the projecting tops of the banks there are usually many trees, which, by the action of frost and water, are soon precipitated into the stream beneath; and thus the river goes on widening and shoaling, while immense quantities of drift-wood are sent down to the sea.

The sandstones and slates continue throughout this portion of the river. The hills on the right bank are generally well covered with spruce and cottonwood, occasionally intermingled with a little birch. Owing to the coldness of the winter climate, none of this timber is

of a large or even medium size. The flats on the left bank are covered with chaparral of cottonwood and willow.

We left Anvic on the 14th of July, and arrived at Nulato after a journey of three days. Nulato is about two hundred miles above Anvic, and five hundred and fifty miles from the sea. This was, as I have before remarked, the most eastern post of the Russian American Company, and the Russian trade and influence extended but little beyond this point.

This portion of the river presents nearly the same topographical characteristics as that which I have just described. The hills of the right bank are, however, higher and more rugged, and in some places the current is extremely rapid.

The only important tributary from the north is the Takaitski river, which empties into the Yukon about fifty miles below Nulato. It is unexplored, but it is said that a great many Indians dwell upon its banks.

On the south, the Shagelook river empties into a great slough of the Yukon, about one hundred and fifty miles below Nulato. This river is also unexplored, but the natives who inhabit its banks are accustomed to visit the stations on the Yukon, for trading purposes, and are described as a fine, healthy, vigorous, energetic race, far superior to the Indians of the great river.

All the natives of whom I have thus far spoken were accustomed to trade with the Russians, and came directly under the influence of the missionaries of the Greco-Russian church. This church had two establishments, one at St. Michael's and one at Ikvagmute or "the Mission," on the right bank of the river, about two hundred and fifty miles below Nulato. I was, therefore, much astonished to find no apparent traces of a salutary influence, no converts, no ideas of the Christian religion, however feeble, among the people. The absence of superstition among them was remarkable. I agree with Mr. Whymper in believing that somewhere, in the depths of their

stupidity, lies buried some faint idea of a Superior Being, overruling their destinies ; but, apparently, they present the astounding spectacle of a people totally without a worship and without a God.

After a short day's rest at Nulato, we started again, on the morning of the 19th of July, and, traveling about two hundred and fifty miles in a direction a little north of east, we arrived at Fort Adams after a journey of about five days.

Fort Adams is situated on the right bank of the river, about twenty miles below Nuclucayette, which is at the mouth of the Tanana river, the greatest tributary of the Yukon. The imposing name of *fort* is, in this case, applied to a simple log-cabin about twenty feet square, which has been erected as a trading station by Americans, since our acquisition of the territory.

The geological and topographical characteristics of this portion of the river do not differ materially from those of the portion just described. The channel is, however, less tortuous, and there are fewer islands. About one hundred and fifty miles above Nulato, the Suquonilla range of mountains commences on the right bank. It extends for about twenty miles, and describes a long, regular curve, the concavity toward the river and the extremities resting at the water's edge. The range is a succession of fine peaks and ridges, and the scenery far surpasses in beauty that of any other portion of the river.

There are a number of tributaries flowing into this portion of the Yukon, but I will mention only two—the Kuyukuk, which flows from the north and has its mouth about thirty miles above Nulato, and the Atutsacoolacushchagut, which runs from the south and enters the Yukon about twenty miles below Fort Adams. The former is remarkable on account of its size and the fact that its banks are inhabited by large tribes of Indians, who in summer have their fishing villages along this part of the Yukon. The latter I notice only on account of its

name, for I am unwilling that my arduous labors in fixing the orthography of this majestic title should be lost to the world. All preceding explorers, unwilling, perhaps, to grapple with this gigantic problem, have passed by this stream without notice.

The Kuyukuk tribe is so much larger than any other tribe on this part of the river, that the Russians have applied the name "Kuyukunski" to all the natives from Nulato to the Tanana. Indeed, the differences between the Kuyukuks and the inhabitants of the other tributaries are but trifling.

These Indians speak a language in some respects similar to that of the Ingeletes and have many of their customs. They are, however, more active and energetic, and have sometimes, although not of late years, been very troublesome to traders and the other natives. In the year 1850, they made a descent upon the Russian fort of Nulato, massacred the inmates, and completely exterminated an inoffensive tribe of Ingeletes who had their village near the fort. In this affair, Lieut. Barnard, of the English navy, who was at that place engaged in the search for Sir John Franklin, lost his life.

Starting from Fort Adams on the 24th of July, we traveled in a general direction about north-east, magnetic. As we passed over mile after mile, we observed that the current was steadily increasing, the river becoming narrower, and the hills higher and more rugged on both shores. Fifteen miles above Fort Adams, we met the current of the Tanana, which colors the water of the main river and fills it with a thousand whorls and eddies, for a long distance below the mouth of the great tributary.

Among all the tributaries which empty their waters into the Yukon, the great Tanana—the "river of the mountains"—in size and beauty stands unrivaled. For only a few miles from its mouth has it been traveled by white men. It apparently comes from the south-east; but it is believed that many miles above the explored

portion it makes a great bend from the east, its sources lying near the upper Yukon.

At the mouth of the Tanana is a large plain, called Nuclucayette. This is the trading-ground of the Tanana Indians. These tribes must be very numerous. They assemble in the spring, at Nuclucayette, where they meet the white traders. The amount of skins procured here far exceeds that taken from any other portion of the Yukon.

Of the Tananas, I know little. They are a fine-looking race, and are said to be active, intelligent and enterprising. Their clothing consists almost entirely of tanned moose-skin; and they are much addicted to the use of ornaments, such as beads and feathers.

In three days we reached the "Rampart Rapids," distant from Fort Adams about fifty miles. At the "Ramparts" the river runs through a gorge in the hills, and is narrowed to a width of about one hundred and fifty yards. Here we saw boulders of coarse granite, a ledge of which, in the middle of the stream, separates it into two narrow, deep channels. This was the only granite that we observed on the river. On the surrounding hills there are outcrops of sandstone, having a peculiar castellated appearance, from which the name "Ramparts" is derived. Through this gorge the river runs with a velocity of at least seven miles an hour.

The Tanana Indians and the Indians of Fort Yukon are occasionally met with between Nuclucayette and the Rampart Rapids. Beyond this point there are no villages until we arrive at Fort Yukon.

For a distance of about one hundred miles from this point the river winds among hills, and our course still had a general direction about north-east, magnetic. When we left the hills we entered a low, flat, sandy country covered with chaparral of willow and cottonwood, thinly intermingled with spruce and birch. From this point to Fort Yukon, a distance of about two hundred

and thirty miles, the river is filled with islands ; its windings are innumerable, and its current runs with great rapidity. It is at the same time so shallow that we had great difficulty in finding a channel of sufficient depth to admit of the passage of our little steamer. All this part of the river abounds in game. Great numbers of moose, and occasionally reindeer, are seen.

In the afternoon of July 31, we arrived at Fort Yukon, and in spite of our hostile intentions, which we immediately announced, we received a warm welcome from the inmates of the fort.

Fort Yukon has been for the last twenty years the most western station of the Hudson Bay Company. It is situated on the right bank of the Yukon, about one mile above the mouth of the Rat or Porcupine river, one of the largest tributaries. My observations, for the determination of the geographical position of this point, are not yet completely reduced and discussed, but I find it to be approximately in latitude  $66^{\circ} 34'$ , and longitude  $145^{\circ} 18'$ . This post was established contrary to a treaty between Russia and Great Britain, and was believed by the English themselves to be west of the boundary line.

The fort is a stockade, flanked by a square tower at each of its four angles. It contains three log buildings, one for the company's stores, one for officers' quarters and one for the men. These buildings are all substantial and well made, and are finished in much better style than the buildings of the Russians on the lower part of the river.

Immediately on our arrival, we put up our observatory tents and mounted our instruments, but a week of bad weather prevented any observations. On August 7th, however, I obtained very satisfactory observations of the solar eclipse ; and on the 9th, having worked an approximate longitude and found that we were about eighty miles within United States territory, we ran up the American flag.

As the river was rapidly falling, the steamer was obliged to set out, immediately, on her return to the sea. She started on the morning of August 10th, leaving Mr. Westdahl and one man, who were to remain during the winter and trade. I also remained with my little party.

The Hudson Bay Company had one officer and three men at this post. Mr. John Wilson, the gentleman in charge, is a Scotchman, who has been ten years in the service of the Company. He did everything in his power to make our stay pleasant, and was of great service to us in many ways. We met, also, the Rev. Mr. Bumpus, a missionary of the Church of England, who was traveling in this part of the country, and whose efforts, I am informed, have been productive of much good among the Indians in this vicinity. The regular missionary, Mr. McDonald, was temporarily absent.

Although I spent a month at Fort Yukon, I had few opportunities of observation among the natives. The settlements are much scattered, and at considerable distances from the post, and the Indians were, for the most part, absent in search of game for winter use.

The principal tribes which have been accustomed to trade at this post are the Kotchakutchins (or lowlanders), who live between the Yukon and Porcupine rivers, near their junction; the Ankutchins or *Gens de Bois*, and the Tatanchakutchins or *Gens de Foux*, who inhabit the upper Yukon; and the Porcupines or *Gens de Rat*, who live upon the banks of the Porcupine or Rat river. These tribes are composed of the finest Indians that I have ever seen. The women are virtuous; the men are brave, manly, intelligent and enterprising. Their clothing is of moose-skin, with the exception of a few articles which they obtain by trade. They fish little, and are almost exclusively engaged in hunting the moose, which abounds in these parts, and in trapping for skins.

For a number of years, a missionary of the Church of England has been stationed at this post. The influence

which he has exerted has been of great benefit to the natives, and, although little has been done toward educating them, they far surpass in intelligence all the other tribes of the river

Taking a general view of the Indian tribes which we observed during our journey, it will be seen that they improve in appearance and character as we depart from the coast. I noticed, also, especially on the lower part of the river, that the natives who inhabit the southern tributaries are in most cases far superior to those who live upon the streams which flow from the north. These differences are undoubtedly due to various circumstances, such as the greater abundance of game in the interior and on the southern rivers, which leads the natives to engage in more vigorous and hazardous pursuits than those which are followed by the Indians of the coast and northern streams. Moreover, the Indians of the southern tributaries enjoy, without doubt, a more favorable climate, and their frequent wars with the energetic tribes which live still further south furnish them with another means of manly culture.

I must not, however, neglect to mention that there is a difference between the coast Indians and those of the interior, so marked that it seems questionable whether these tribes could have had the same origin.

The Asiatic origin of the Esquimaux and coast Indians, and, I believe, of the Aleuts and some other of the tribes of southern Alaska, seems to be generally admitted by scientific men. Mr. Whymper mentions several interesting facts bearing on this point. In the vocabulary of the Malemute language, which he compiled, there are a number of words almost identical with words of similar meaning in the languages of the Greenland Esquimaux, a circumstance which goes far to show the common origin of all these coast people. He also calls attention to the fact that intertribal trade has been carried on for years across Behring Straits between the natives of the Asiatic



and American coasts, showing with how little difficulty a colony of "Wandering Tchuktchis" might cross from Asia and populate the northern coast of America.

Mr. Whymper mentions two remarkable ocean voyages made by *junks*, in the years 1832-3, from Japan to the north-west coast of America and to the Sandwich Islands. To these I may add a third voyage, no account of which, as far as I am aware, has yet appeared.

I was informed, while at Sitka, that a number of years ago (exactly when, I could not ascertain), a large Japanese junk was driven by stress of weather into that harbor. The boat being a wreck, the governor of the Russian Company gave the crew permission to settle upon one of the islands. Here they built themselves houses and remained for several years, manufacturing various articles of use and ornament, which they disposed of among the Russians and natives. When they had accumulated the means to rebuild their boat, they returned to Japan.

This barren outline is all that I have been able to ascertain concerning this remarkable little colony. The archives of the Russian Company, now in the possession of our government, will undoubtedly furnish a more accurate and complete account.

The island which these people are said to have occupied still bears the name of Japan Island, and on it the remains of houses, unlike those occupied by Russians or natives, may still be seen. Many Japanese coins are found among the Indians, and this fact has been adduced as an argument in favor of the Asiatic origin of the tribe; but they were undoubtedly obtained from the little colony on the Island of Japan.

But, interesting as this subject is, the limits of my paper will not permit me to dwell longer upon it; and I must hasten back to my river, from which I have wandered for so great a distance.

We spent nearly a month at Fort Yukon, during which time we obtained many meteorological, magnetic and

astronomical observations. Our duties in the observatory kept us occupied during the two or three dark hours of the night, and we consequently had frequent opportunities to witness brilliant displays of the aurora borealis, which was visible on nearly every clear night during our stay.

The lights were most brilliant in the south-east or about the magnetic north, and from that quarter traveled in flashes over the sky toward the west and south. They presented the appearance of a series of delicate, transparent, silken curtains of a soft white color, brilliantly illuminated and moving through the heavens with a slow, waving motion, with many foldings and unfoldings, as if moved by gentle breezes. On one occasion they apparently came so near the earth that they seemed almost within the reach of an outstretched hand.

During these displays the suspended needle of the magnetic declinometer was drawn toward the eastward so much that the extremities apparently touched the sides of the box.

Some persons say that during these displays they have heard a low, sighing sound ; but this I have never noticed, and I am inclined to consider it an acoustic illusion. So impressive is the effect produced by these phenomena that the very stillness seems to be audible.

We stayed at Fort Yukon until the later part of August. We had hoped to be able to remain still later ; but were informed by Mr. Wilson, whom long experience had rendered a competent judge, that the weather-signs gave promise of an early close of the season, and we would have no time to spare in getting to the sea before the river should be closed.

I had made my plans to descend the river in Indian canoes, but found that, as most of the Indians were absent, none could be procured. In this state of affairs I had recourse to the talents of one "Mose," a Canadian Frenchman, in the employ of our traders. Mose was not

a professional ship-builder, but he had considerable skill in handling tools, and his wits had been sharpened by many years of life in the woods. He pondered upon the momentous problem for several days, and then fell vigorously to work. We all assisted to the best of our ability, and the result was a boat. It was not pretty ; it did not look "fast," and we had well-founded fears that it would not keep out the water. Nevertheless we all agreed that it was much superior to no boat ; so we launched it upon the broad waters of the Yukon, and named it the "Eclipse."

In this craft I started, accompanied by Mr. Major and Private Foley, on the 28th of August, bound for Redoubt St. Michael's, more than twelve hundred miles distant. We traveled in this way as far as Anvic, going into camp at night. As far as Nulato we were accompanied by two Indians, one a Kuyukuk and the other an Ingelete, who had been brought to Fort Yukon by an American trader. Arrived at Nulato, however, they could not be persuaded to depart again from the vicinity of their "happy hunting grounds," and we were therefore obliged to work our passage for the remainder of the voyage.

Moreover, the "Eclipse" did not wholly answer our fond expectations. I know not what principles of naval architecture were violated in her construction, but I am confident that during the trip she exhibited every fault which it is possible for a boat of her dimensions to possess. Nevertheless she brought us safely to Anvic, where we discovered that she had become unserviceable beyond the hope of repair. •

I recall the experiences of this portion of my journey with feelings of unmingled pleasure. It was filled with small adventures, trifling hardships and healthy exertions. Every night a camp-fire of huge dimensions blazed before our little tent. Here we cooked our bacon and our "pemmican," and prepared a feast which to-day Delmonico cannot equal, to my taste. Then, after a quiet

pipe by the fire-light, we betook ourselves to bed (or rather to *blankets*), and slept the sleep known only to children, and men without care. But, tempted as I am to linger among these scenes, I must deny myself the pleasure of further description; for the length of my paper already promises to be too great a trial to your patience.

At Anvic I was unable to obtain boats suitable for travel down the river and along the coast, and, besides, the Indians were afraid to attempt such a journey so late in the season. The situation was somewhat awkward, for the little trading station had barely sufficient provisions for its three men, and we could not possibly subsist there during the winter.

In this juncture I consulted Mr. Clark, the chief trader of the station, and old Manca, the "staruk" of the village. Manca said that, during the summer months, the Indians often ascended the Anvic river to a point near its head-waters, from which they made their way by a route not very difficult, to an Indian village on the coast, about eighteen miles north of St. Michael's. He, however, expressed strong doubts as to our ability to reach this point so late in the season, since, owing to the freezing of its mountain sources, the river was very low. Mr. Clark, who has had considerable experience as a traveler in northern Alaska, was nevertheless a new-comer to this particular part of the country, and consequently declined to give any advice; but he volunteered to accompany me should I decide to make the attempt.

This being the only practicable way out of the country, I naturally did not hesitate long. Accordingly, on the afternoon of the 14th of September, having by Mr. Clark's efficient management obtained a goodly number of canoes and Indians, we paddled away from Anvic determined to make a desperate attempt to get to the coast.

We found the river very shallow, and running almost everywhere with the velocity of a mill-race. We passed several Indian villages on our way and stopped to rest and

trade, and on two occasions we slept in the Indian huts. After five days of hard labor, paddling and poling, we succeeded in reaching a point about fifty miles up the river. Here we found the water so shallow that we were obliged to abandon all hope of proceeding further in this way. But we were unwilling to turn back, and so we decided to attempt to cross the country in a straight line for Ikikiktoik, an Indian village on the coast, near St. Michael's. We therefore abandoned our tent and such other articles as we could spare, and, packing our remaining baggage on the backs of Indians, began our journey.

In this trip we passed over three ranges of hills, averaging from 1,500 to 2,000 feet in height, and through the intervening valleys and water-courses. The valleys are so swampy as to be almost impassable, and, in many places, the swamps extend to the very tops of the hills. A great part of the country is covered with a thick, coarse moss, more than a foot in depth, which renders foot-travel extremely fatiguing and difficult.

We experienced many hardships in this journey, and were reduced almost to starvation from lack of provisions. However, at the end of five days, our tribulations were ended by our safe arrival at Ikikiktoik. From thence we made our way to our ship at St. Michael's, without difficulty.

Mr. Clark accompanied us, voluntarily, throughout all this journey, and cheerfully shared all our hardships. We were much indebted to his experience and knowledge of the country for the safe issue of our somewhat doubtful experiment.

On our return voyage to San Francisco, we stopped a few hours at the Seal islands and several days at Ounaslaska, where we obtained the first news of the civilized world we had received during six months. From thence a voyage of twenty-seven days, during which we experienced a good deal of severe weather, both in Behring sea and the North Pacific, brought us to San Francisco,

where we arrived on the 6th of November, exactly seven months from the day and hour at which we sailed from the harbor.

During our journey on the Yukon, we succeeded in determining, by astronomical observations, the geographical positions of several points; and we also made a running compass survey of the river, with topographical sketches and notes, from which I hope to prepare a map of the country, which, if not very accurate, will at all events be more satisfactory than any that has yet been produced.

Owing to the kindness of Capt. Ridell, a trader at Redoubt St. Michael's, I obtained a very complete set of barometric observations at that place, which, with those taken during our journey and at Fort Yukon, will, I think, suffice for the construction of a tolerably accurate hypsometrical section of the river.

There is one question which is on the lips of almost every intelligent person who takes an interest in the prosperity of the country, to which I must give attention before concluding this paper. This question is, what is Alaska worth?

With reference to that portion of the territory in which I have most traveled, I may, perhaps, be able to give a tolerably correct answer; but with reference to other and probably more valuable parts, I feel that my opportunities for observation have been too limited to justify me in hazarding a decided opinion. Nevertheless, as many persons of much less experience in southern Alaska than myself have not hesitated to pronounce, with confidence, upon the resources of the country, I may, perhaps, be permitted to make a few remarks even on this subject.

Many resources, both animal, vegetable and mineral, have been claimed for the new territory. It has been stated, and with truth, that owing to the influence of the warm Japanese current which runs northward to Behring Straits, and then, turning southward, follows the coast,

the mean temperature in the same latitude is much higher on the Pacific side of the continent than it is on the Atlantic. With this fact as an explanation, assertions have been made concerning the capabilities of Alaska for agricultural development which my observations do not confirm. As far as the region of the Yukon river is concerned, the question may be set at rest by a simple statement. In the month of August, we ascertained, by digging at Fort Yukon, that the earth was frozen at a distance of less than two feet below the surface. I am reliably informed that this is also the case on the island of St. Michael's. As for the *gardens* which it has been said exist at the stations on the Aleutian Islands, I can only say that those which I observed were not extensive in dimensions, nor could the results be regarded as satisfactory.

It is amusing to compare the Russian statements, with reference to these islands, with the bright pictures presented by some of our own authorities. From a Russian document prepared in answer to a request from our government for information in regard to the system of division of lands employed in Russian America, I cull the following interesting extracts :

\* \* \* "The soil itself being perfectly barren, and *unfit for either agricultural or grazing purposes*, there was no reason why the natives should endeavor to extend the limits of their lands. \* \* \* Who can ever have a mind to settle in that country, where permanent fogs and dampness of atmosphere, and want of solar heat and light, *leaving out of the question anything like agriculture*, make it impossible to provide even a sufficient supply of hay for cattle ; and where man, from want of bread, salt and meat, to escape scurvy, must constantly live upon fish, berries, shellfish, sea-cabbages and other products of the sea, soaking them profusely in the grease of sea-beasts."

I might continue these uncomplimentary selections, but

what I have already quoted will probably suffice. This is the country of which it has been said that "gardens flourish along the coast in the Russian settlements, producing all the vegetables requisite for domestic use!"

At Sitka and Kodiak the agricultural prospects are no brighter. With the exception of a very few watery turnips and potatoes, all vegetable supplies are and always have been furnished from without the territory.

On the peninsula of Kenay, between Cook's inlet and Prince William's Sound, there are said to be a few acres, which, owing to their sheltered position, are more productive than any other part of Alaska. This favored spot is, however, unfortunately so limited that there is not quite enough for a single farm!

I have already expressed my reluctance to giving an opinion on this question, but, in view of these facts, am I not justified in reiterating a statement which has been denied, that Alaska is not an agricultural country?

Extensive forests of spruce, hemlock and cedar cover the southern portion of the territory, which will undoubtedly be of great value in the distant future. At present, they cannot compete with the vast and more accessible forests of Oregon and Washington Territory. The mineral resources claimed for Alaska are unbounded. I notice, however, that most of these valuable deposits are still classed in the category of things that are probable.

On the Stakeen river, and at some other places in southern Alaska, the discovery of gold has been reported, and some sanguine persons have even predicted, in this locality, a return of the old Californian days of 1849. Strange to say, no eager crowds have as yet flocked to this interesting region, as is the time-honored custom of California on the discovery of new and rich deposits. When it is considered that gold in traces is one of the most common occurrences in nature, perhaps our miners may be excused for delaying a little until they can obtain more accurate information.



Silver has also been reported ; but when the localities were sought where it was said to exist, they were not to be found. Native copper undoubtedly exists in various localities. A specimen of what was said to be this metal, and to have been obtained in Alaska, was exhibited to me in San Francisco. It was most unmistakably a piece of gun-metal, and appeared to have been melted and run into a hole in a stump, in order to give it a natural appearance. This material does not *usually* occur "native;" but if deposits of it exist in Alaska, I think we may regard them as an extremely valuable acquisition !

A valuable deposit of coal has been discovered on the southern coast, in the vicinity of Kodiak Island ; but in regard to its extent, I am not informed.

On the banks and in the vicinity of the Yukon river, I found no traces of mineral deposits, with the exception of a small seam of coal situated near Nulato, which was, however, altogether too limited for profitable working. An individual in San Francisco, who enjoys the credit of having founded several startling rumors regarding the wealth of the new territory, states, I am informed, that he observed *solid bluffs of copper* on the banks of the Yukon. My own examinations were necessarily so cursory that I am not prepared to say that valuable minerals do not exist in this region ; but I can state with confidence that bluffs of copper do not exist in this part of the territory.

Speaking of the mineral resources of the river, an enthusiastic writer remarks that "when the stars and stripes shall float at Fort Yukon, we may look for mines of gold and silver being discovered quite as rich as those further south." The stars and stripes now float at Fort Yukon ; any one who desires is at liberty to look for mines, and I doubt not that, when found, they will prove equal in richness to those of southern Alaska !

There are enormous quantities of salmon and other fish in the rivers of Alaska. These fish seem to increase in

richness and delicacy as we go north. They are far superior, in these respects, to any that I have seen elsewhere. It seems scarcely probable, however, that they can be profitably brought to a market while the waters of Puget's Sound and the Columbia river furnish a nearer and an abundant supply.

There are also extensive cod-banks off the Aleutian Islands and on other parts of the coast, but these fish are not, in my opinion, equal in quality to those obtained on the Atlantic coast; they may, however, become a source of considerable profit.

But it must be admitted that of all the present resources of Alaska by far the most valuable is to be found in its fur-bearing animals. Chief among these is the fur-seal, which inhabits the two small islands, St. Paul and St. George, situated about two hundred miles north of the Aleutian group. Up to this time, we have derived little or no revenue from these islands. The habits of these animals are so peculiar that they require to be hunted with great care, for, should they become alarmed, there is danger that they will leave the islands and never return. Congress has, therefore, prohibited, for the present, the prosecution of the seal fisheries until proper regulations shall have been determined upon. About 125,000 of these animals may be killed yearly without danger of diminishing the supply, and on these it is believed that a tax of one dollar per skin is as much as the government can reasonably collect.

Among the Aleutian Islands a good many sea-otter skins are obtained, but this trade is insignificant, in comparison with the seal fisheries.

With regard to the inland fur trade of Alaska it is difficult to obtain reliable statistics. As far as the region of the Yukon river is concerned, its value has been greatly exaggerated. The furs are much inferior in quality to those of Siberia. True sable does not occur; that which bears the name of "American sable" is nothing more

nor less than stone-marten. The ermine is worthless and is never sent into the market. The Russian Company, paying its employés a mere pittance, was able to prosecute the trade at small expense. The high wages required by American traders greatly diminish the profits in this business. Nevertheless the inland fur trade of Alaska cannot be regarded as of small importance, and it may be that American enterprise will, in the future, render it far more lucrative than it has been in the past. From these remarks it will appear that it is no easy matter to prepare a balance sheet in the affairs of Alaska; but whatever may be the resources of the territory, the experience of the last two years shows clearly that they are destined to develop slowly.

A detailed statement of the receipts and expenditures on account of Alaska, during the last two years, transmitted to the House of Representatives by the honorable Secretary of the Treasury, exhibits the following interesting totals: Receipts, \$21,849.34; expenditures, in excess of cost of troops, steam cutters, etc., which would have been incurred elsewhere, \$597,789.19; revenue from the territory for two years, minus \$575,939.85. If from half this amount we deduct \$125,000, which it is hoped we may receive yearly, hereafter, from the seal fisheries of St. Paul and St. George, we have remaining, minus \$162,970 as the yearly income upon our investment of \$7,200,000 in this lucrative territory. This is the amount in coin which our government paid for Alaska, and the coolness with which Russia now demands interest upon this sum, from the time of signature of the treaty to the time of payment, is refreshing in the extreme.

I say nothing of the additional expense of a possible civil government. The people of Alaska, exclusive of those in the service of the government and the natives, number about one hundred and twenty-five. To speak mildly, the majority of these people are not, as a general thing, celebrated for a high order of intelligence or

probity. It is not probable that our government will at present indulge them in this expensive luxury.

It will be seen, from what I have said, that I am unable to take a cheerful view of the pecuniary prospects of our new territory ; but I should be sorry to have it thought that I base the value of our acquisition upon pecuniary considerations alone. There are other points of view from which this question must be examined ; other interests which, among intelligent and thoughtful men, will appear to be quite as important as matters of dollars and cents.

The position of Alaska, in a political point of view, inclosing, as it does, with Washington Territory, the possessions of Great Britain on the Pacific coast, and rendering probable an early effort to make our territory continuous, is a consideration of importance which has been discussed and admitted by all.

The question, what is to be the future of the native tribes under the new regime ? also demands serious attention. Hitherto, their only relations with white men have been with the employés of the great companies, whose duty and interest have been to preserve the most friendly relations with them. The natives, if I except the inhabitants of the Aleutian and Seal Islands, have made little if any progress toward civilization. Nevertheless, owing to this policy of kindness, they are, for the most part, peaceable and friendly toward the whites. It is a solemn question whether this state of things is to continue, or whether wrong and outrage are to follow the footsteps of our traders, until we are obliged to establish in Alaska an "Indian system" like that which has been the curse of the western plains.

I am glad to be able to look upon the bright side of this picture. There are commercial considerations, by virtue of which I believe that the trade of Alaska must fall into the hands of large and wealthy companies, whose

interest it will be to continue the kindly policy hitherto followed with such good effect.

The question often asked, whether we may not be able to diffuse intelligence among these people and raise them gradually to a higher position in the scale of existence, is one which I cannot attempt to answer. I noticed one thing, bearing on this point, among nearly all the tribes — the almost total absence of inventive inquiry. Take, for example, the article of gunpowder. Is it not astonishing that a people should depend for years for their subsistence upon this article, which they obtain from white men, and for which they regard no price as too high, and yet the questions never have occurred to them, what is it? how is it made? where does the white man get it? I do not altogether despair of the future improvement of the Indians, but, in the consideration of this question, this feature seems to me most discouraging.

Finally, I must not fail to notice that the acquisition of Alaska has opened to the American people new fields of discovery, new sources of knowledge. Before the acquisition of the territory, Russian America was to most of us a *terra incognita*; to-day the little that is known of the country is known by all, so rapidly has information been diffused and so eagerly received. Year by year we shall add still further to our knowledge of this once distant country. We shall find the sources of its mighty rivers; we shall follow the shore of the wondrous northern sea; on every hand we shall make acquisition of new and abundant treasures of science, which shall continue to enrich mankind when our lost millions have been long forgotten. If these are to be the results of the acquisition of Alaska, I am confident that, whatever may be the doubts of statesmen or the lamentations of economists, there will be consolation and satisfaction in the Hall of the Geographical Society.

## IV.

EXPLORATIONS IN THE ROCKY MOUNTAINS AND  
THE HIGH PEAKS OF COLORADO.

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BY PROF. W. H. BREWER, of Yale College.

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READ FEBRUARY 28, 1872.

MR. PRESIDENT, LADIES AND GENTLEMEN : It may be well to preface the subject that has been announced, that is, my own explorations in the Rocky Mountains, by some general considerations of this great mountain system of which they are but part. As you are aware, this mountain system which stretches along the western side of our continent is the grandest on earth, considered in its geographical extent, in its scenic aspect, in its economic importance to the world. Extending as it does from Cape Horn upon the south to the Arctic ocean on the north, bristling as it does nearly its entire length with volcanic peaks, extending into the cold regions of the north from the regions of the Tropics, having every variety of vegetation, it has concentrated in it all the various features we will find elsewhere in other mountain chains on the Globe. But that is not all. That is really the great store-house of the precious metals at the present time. Nearly all the precious metals of the world come from one or another portion of this great chain.

Stretching along the western coast of South America is a comparatively narrow chain — we call it the Andes. There we find the highest volcanoes on the earth. Then, sinking in height along the Isthmus, the continent shrinks in width, so that in one place from ocean to ocean it is only thirty miles wide, and in several places

the altitude through gaps is not more than five or six hundred feet. At the gap between Virgin Bay, on Lake Nicaragua and the Pacific, it is but a little more than four hundred. In fact, along that portion of the country, extending some 1,400 or 1,500 miles, there are numerous low gaps, so that no less than nineteen or twenty routes have been proposed for canals, and quite a good many railroad routes have been projected. North of the Isthmus of Tehuantepec this chain spreads out like a fan across Mexico, attaining its greatest width in the United States along about the fortieth parallel, or about where the Pacific railroad crosses it. North of this point the western members of it take a more northerly course, and the eastern members more north-westerly. It becomes narrower again, and, after passing on into British Columbia, the chains of the northern part have never been studied nor mapped. In Central America and Mexico there are many active volcanoes; but as we get further north within the limits of the United States, throwing out Alaska, there are more volcanoes, extinct, not active. There are no active volcanoes, in the popular sense of the word, anywhere in this mountain system in the United States, but there are a great many mountains that are extinct volcanoes, and which show signs of their volcanic action in a variety of ways, by hot springs and by steam vents. Lassen's Peak was smoking and steaming in 1856. Mount Shasta has one near its summit. I was told by the Indians that the Indian name, "Shasta," meant smoking. Mount Hood, Mount St. Helens and Mount Rainer are all of them not only extinct volcanoes, but showing in their old craters still signs of their activity in hot springs and steam vents. Along the northern portion of California and the western part of Idaho there are extensive overflows of lava. There is a single patch of lava in northern California which covers nearly 10,000 square miles. Mount Shasta, the highest point measured in the United States except one, is over

14,000 feet — the grandest peak in some respects in the United States. Volcanic materials have been piled up entirely since the cretaceous period. You take out of these rocks fossil shells marvellous in their perfection, so perfect that they still show the gloss upon their surface: *nacre*, as the conchologists call it.

Passing to the north of the mountain we find the same strata running through it. The whole of this mountain system, that is found within the limits of the United States, was formerly known under the name of the Rocky Mountains. I don't know who first used the name, or why it was used. Why they should be called Rocky Mountains I don't know. They are not rocky more than other mountains. Only thirty years ago we used to hear of the Rocky Mountains of California. Nuttall, the botanist, who visited that region in 1835 and 1836, spoke of them as the Rocky Mountains. Now, we no longer apply the name to any of the western mountains, and it is applied only to the extreme eastern portion of this great mountain system; for it is the eastern portion which forms the back bone of the Continent; and that is the portion we now generally call the Rocky Mountains.

There has long been a romantic interest attached to this very name; the height of the regions, the uninhabitable, inhospitable peaks, its fierce animals, its wilder and fiercer men; the great distance of some portions of these ranges from navigable waters — all have combined to throw around it a peculiar charm of romance.

I will say a few words about the other high peaks of the United States. I have hung up these diagrams. This one represents, nearly, the river system of that portion of the United States lying west of the ninety-ninth meridian. I have drawn on it the river systems, and simply the location of a few of the more marked high peaks. Now, as I have said, this portion, which is a few miles wide on the fortieth parallel, is a little narrower to the north and a little narrower to the south. This moun-



tainous portion of the United States embraces an area of a little over a million square miles. The western members of this we call under the name of the Cascade Range, until it strikes the boundary of California, and then we call it the Sierra Nevadas. The eastern members of it we call the Rocky Mountains. The Sierra Nevadas are only broken through at the northern portion by the Columbia river. We can hardly call it broken through here at the south, because the Colorado passes down behind it. The Rocky Mountains pass down through here [indicating it on the map]. They drain everywhere; east into the Atlantic, and west into the Pacific. There is a popular belief that when you cross the Rocky Mountains you are in the great basin. It is not so. If you cross south of Fremont's Peak, you only get into the valley of the Green river. If you cross north, you get into the Columbia valley. West of these lines is another little range of mountains, which we call the Wasatch, which forms the eastern rim of the basin. The basin does not extend north of Utah and Nevada.

A few words more about the western chain or Sierra Nevadas. This is the grandest one in its scenery, and has also the highest peaks. All of the high peaks are extinct volcanoes. A few of them have been measured. First, on the north, is Mount Baker, which has never, as yet, been ascended. It has recently been reported by Prof. Davidson as 10,719 feet. I take this number from the newspapers containing his report, which he made before the California Academy of Natural Sciences, a short time ago. From the same authority we have it that Mount Rainer is 14,444 feet, measured trigonometrically, which is the most unsatisfactory way, unless it is measurement by boiling water on the summit. Geographers will understand what I mean. There are various difficulties in the way which I have not time to explain. We must know the height of the base, and it is very difficult to get a base near the mountain; but it seems to

me the laws of refraction are not well understood. Certain it is that all our western mountains that have been thus measured have, with some rare exceptions, not proved anywhere near so high as they have been made by these means of estimation.

Mounts Baker, St. Helens and Adams have not been measured. Mount St. Helens was ascended this summer by one of Mr. King's party. Mr. Emmons, also, ascended Mount Rainer. The difficulty consists in getting to the base. You have to go through a very great distance of dense forests, with large amounts of fallen timber. Mount Hood has been measured. That was the mountain which was formerly called the "monarch of American mountains" — 16,000, 17,000 and 18,000 feet high, of which the latter number was by far the most popular belief; and, indeed, one called it 21,000 feet high. It was afterward measured by Lieut. Williamson, connected with the corps of engineers, who has spent some years in elaborating the laws of barometric pressure, and he made it only 11,225 feet high. It was measured again by one of Mr. King's party, last summer, and they made it almost precisely the same height. It was also measured by Prof. Collyer, of Oregon, and he made it almost precisely the same.

Passing into California, we have the high peak of Shasta, which I had the honor of measuring in company with Prof. Whitney, 14,441 feet high. South of this is Lassen's Peak, not so high, but probably commanding a better view than any other mountain in America. I was on the Peak twice, the second time passing ten hours on the summit. I went up in the night, so as to be there at sunrise. Knowing the topography, we took opportunity at sunrise to get bearings on the most distant points, which, afterward drawing a line from each of the most distant points around the horizon, encircled an area of more than 47,000 square miles. I know of no other point in America where so great an area can be seen at any one

place. The mountain, however, is not very high as compared with others.

Then passing south we have Pyramid Peak and Wood's Peak, neither of them reaching quite to 11,000 feet. Then a great mass of peaks lying just back of Yo Semite, reaching 13,000 feet. As Mark Twain says, when you get to Yo Semite don't think you have got to the end of the scenery; you are just on the edge of it. Yo Semite lies in the centre of the chain there, or the centre of the chain is in the centre of Yo Semite valley, almost within a mile of it. But by continuing your trip back of Yo Semite (there is a good trail, used by packers to get across the Yo Semite valley to Mono lake), you come to a point where travelers can reach a greater altitude than in any other place in California; and there is no other place where you can get so high with so little labor as on that trail on that peak. You will find the other mountains of California much too rough for comfort. But on this, even ladies, with good lungs and sound hearts—I speak physically—[laughter] can get to the top of Mount Dana, which is 13,227 feet high, with considerable ease. One little girl, only six years old, has made the ascent. I persuaded a cripple to ascend a mountain 12,000 feet high.

There you have a very extended view of scenery, embracing the western slope of the Sierras. You see the great central valley upon the west, and you may get views there extending vastly further than any you will find in the Rocky Mountains, with comparatively little fatigue. If any of you go to Yo Semite, don't be satisfied with that; but if you want to get a good view of the country, go upon the outside, look back, and see the grander peaks and snow-fields and forests lying back towards the crest,—Mount Dana, 13,227 feet, Mount Lyell, 13,217 feet, etc. Messrs. Gardner and King measured others in the vicinity not quite so high; a little less than 13,000 feet, which I have not marked here on the map.

South of this group, I will remark, there is not a gap

known less than 11,000 feet for 150 miles. St. Bernard, in Switzerland, which is called an exceedingly lofty pass, is only 8,200, while here is a chain where there is not a single pass below 11,000 feet for 150 miles. The chain culminates at this point, and here is the highest mountain in the United States, which we named for our chief, Prof. Whitney. Mount Tyndall, lying near it, is 14,380 feet high, and Mount Brewer 13,886 feet. Nobody has yet been upon the summit of Mount Whitney; but Mr. King attained an altitude of 14,740 feet. In this cluster of peaks there are a dozen peaks above 14,000 feet. It is somewhat interesting to know that the lowest point in the United States is not far distant from Mount Whitney. The United States and California Boundary Commission got in there by mistake, and took barometric observations. The valley is probably 70 or 80 feet below the sea level. It takes its name from the fact that several emigrant trains which got in there have miserably perished.

The Sierra Nevadas are superior to the Rocky Mountains in scenery. You have there grander forests, greater fields of view. Of the mountains of the Great Basin I shall not attempt to speak. They have a scenery entirely their own. I have never ascended any of the higher peaks.

We will now consider the Rocky Mountains. There are enough mountain peaks there to satisfy the ambition of all the young explorers which the United States can produce for many years. While there are certain features in common, there is a marvelous difference in them. Each peak has a personality of its own. They are much alike in this. You have during the summer season a marvellously transparent, clear air, so that it offers no impediment often to the most distant view. You have, furthermore, a very large number of very high peaks. You have peculiar features of vegetation. But I might say that the most characteristic feature of any of these mountains is the vastness of the scene. Those of you

who have visited Switzerland and been upon the high Alps, or upon the Alps which are not so high, the Rigi or the Faulhorn, for instance, know how enthusiastic tourists become. You go up there, and they say, "Why, that peak is forty miles away, and that one is fifty!" and you feel exhilarated and enthusiastic. But when you get upon the loftier peaks of the Rocky Mountains you accomplish it with much more fatigue. You have got to go a longer distance to get up there than you have to go in Switzerland, on account of the civilization that you find there. When you get to the top you have a vastly wider view. It is not only *impressive*, but *oppressive*. On the top of the Swiss peak I felt like jumping up and shouting, but upon the Rocky Mountains I felt like sitting down, and saying never a word. It is easy to see why this feeling should come over one when you have seen the two countries. I might say that while Switzerland embraces an area of 16,240 square miles this region embraces an area of 1,100,000 square miles. These figures, however, don't convey an accurate idea of the difference in vastness between the two regions. You don't appreciate it. I can show it in another and better way. I brought along the government map of this western region. It embraces the whole region west of Lake Superior. This is known as Warren's map. I now pin on that a little piece of black paper which represents the size of Switzerland, plotted on the same scale. As I said before, in round numbers one is 16,200 square miles, the other about 1,100,000. The various authorities differ by more than 150,000 square miles—nearly ten times the area of Switzerland.

But I am taking up too much time with these preliminaries.

Next is the Rocky Mountains—that is, the eastern chain. The earliest writers speak about it as not a continuous chain, but groups. If you read the old accounts of these hunters, or the missionaries—of Dr. Whitman,

Dr. White or Dr. Parker—any of those persons, you will find they all speak of the groupy character of the mountains, the grouping of the peaks, and the passes between them; but if we examine them on a grand scale, we will find there are two great groups. The first is the northern one, embracing several distinct and minor clusters. The other is this great group—the southern group. Of this northern group there has been, as yet, only one point measured. It was this point [indicating it on the map], a peak that was first ascended by Capt. Bonneville, I don't know how many years ago. It was pronounced more than 18,000 feet. It was called then Union Peak. Afterward it was ascended by Col. Fremont, and found to be 13,570 feet. It is in many respects the most interesting mountain of the whole chain. It is in a region that has vastly more snow than the southern Rocky Mountains. It is a peak that has been known longer. That group of peaks was described as far back as the days of Lewis and Clark. After Fremont ascended it, it went on the map as Fremont's Peak, and remained on all the government maps by that name until the time of the war, when Fremont, politically, was under a cloud for a little while, and then some of the government maps left off his name from the peak, and put on again the name of Union Peak. The later government maps have restored Fremont's name and put the name Union Peak to a peak some distance north-west in the same chain. What makes that mountain especially interesting is, it was then, and by all previous travelers, supposed to be the highest of the Rocky Mountains, and it was not known until the explorations of Dr. Parry, long afterward, that it was not the highest peak of the Rocky Mountains. It was a dogma of geographers that the greatest rivers rose on the highest land. Here, I am told, within a mile of each other, are the head waters of the Columbia, the Missouri and the Colorado. The three rivers rise and find their way to the Pacific through the

Columbia. Upon the north-east side rises a little river known as the "Wind River." From this point to this [indicating it on the map] is known as the Big Horn. Then the Yellowstone; next the Missouri; finally, the Mississippi. The Missouri river proper, under that name, does not extend to the Peak.

West of Fremont's Peak are three volcanic peaks—as far as I can ascertain, the most important volcanic peaks in the group. There are peaks which are supposed, by hundreds, to be higher, even, than Fremont's Peak, because they are sharper, and sharper peaks are generally estimated to be higher than broad ones. Near Laramie, the peaks are more rounded. Sandstones extend almost entirely across the chain. South of this gap, which you all know is where the Pacific railroad passes, we have this other large group of peaks lying in here [indicating it on the map], of which only a portion have been explored, while off in this direction is a great unexplored region absolutely unknown to geographers. Of this set of peaks there have been quite a number measured. Of the northern group but one, Fremont's Peak, has been measured. Let me remark here that that is the only peak above 13,000 feet that has ever been measured by any United States military officer. Up to this time twenty distinct peaks above 13,000 feet have their heights recorded and made public. Of these there has been only one measured by any military officer of the United States. Mr. King's party, although working under military authority, are civilians. They measured some other points more than that, but they have not, as yet, been made public. About six or seven years ago Dr. Perry, the botanist, from Davenport, Iowa—who is now down at San Domingo, by the way—alone, with his own resources, with his barometer on his back, traversed a portion of the Rocky Mountains here, and contributed by far the most important number of high altitudes that any person had as yet done. Taking these peaks in here

[indicating it on the map], he estimated Long's Peak at 14,056 feet. Four years ago it was ascended by Mr. Powell, of Colorado fame, in company with Mr. Byers, of Denver. They took up a barometer, but did not, unfortunately, take complete observations so as to know its actual height; but Prof. Whitney calculated, from these imperfect observations, that it was about 14,050 feet, coming very near Dr. Parry's measurement.

There is a little peak north-west of this, known to hunters by the name of Velie's Peak, found to be 13,456 feet. This was measured by Dr. Parry. West of it is another peak, Mount Audubon, measured by Dr. Parry, and estimated to be 13,402 feet high. Next comes Parry's Peak, 13,133 feet high, and next Gray's Peak, 14,145 feet, or, as measured by Dr. Parry, 100 feet higher. A little further south is Mount Guyot, 13,223 feet, and Mount Rosalie, which is probably about 13,000 feet. Here is Mount Guyot, and here is a mountain commanding a most exquisitely beautiful view, known as Silverheels, which is 13,650 feet. Then comes Mount Lincoln, called the highest peak of the Rocky Mountains for a long while, 18,000 feet. Why this 18,000 feet should be applied to all mountains I don't know. You see Velie's Peak and the mountains of British Columbia,—they are all put down at 18,000 feet. Pike's Peak was first called 18,000 feet; Mount Shasta was also first called that. Near Mount Lincoln is a peak sometimes called Quandary Peak, sometimes McCollough's Peak, sometimes Ute Peak, and one man called it Hoosier Peak. South of Mount Lincoln the chain stretches along here quite high. We were on a peak here called Horseshoe Peak, from a peculiar amphitheatre in its side. The peak is 13,806 feet high. Down here on the west is this great isolated mass of Pike's Peak, 14,218 feet; then the Buffalo Peaks, not measured. We ascended two peaks here, in a region not before explored, which we named for our universities, the northern one Mount Harvard and the southern one



Mount Yale ; the former 14,270 feet, the latter 14,078 feet.

I have enumerated now all the peaks whose heights are above 13,000 feet, which have been accurately measured and published to the world, in the United States. In other words, there are twenty peaks whose heights are above 13,000 feet, and, as I have enumerated them, ten above 14,000 feet.

I have already remarked that we have very few volcanic eruptions in the Rocky Mountains. Before I consider these peaks, a word more about the chain as a whole. And perhaps I cannot do better than to speak of the plains, for they are really a part of the mountains. This plain, which stretches 600 miles west of the Missouri, is not level. Its western edge is tilted up against the mountains. It is really a part of the mountains. If you don't believe it ask "Uncle Sam," who paid roundly for a road over a portion of these plains simply because it was high. The mountainous boundaries of the Pacific road commenced where, in height, they were mountains ; in other respects, hardly so. If we pass west, on the Pacific road, these plains seem as vast as the seas. They are wonderfully interesting, but this interest does not wear. To me the impression was the same on the plains as on the sea ; everything except sea sickness. Here is the deck of the ship. You see just out two or three miles, and that is all you do see. This visible horizon travels with you. You go out of the captain's door every day to find how your horizon is. You are a little excited one day to see a sail. It comes up higher and higher as you approach it. Finally you dip your flag to it, and you watch it until the hull goes down ; then the sails, and finally, before night, it drops out of sight behind you. There are exactly the same effects on the Pacific road. There is one place where for more than forty miles there is not a bend in the track. In the spring it is green, in the summer it is ashen gray. You sit upon the back platform and you see these two shining

bands of iron, which, as you pass rapidly onward, seem to come closer and closer together, until they almost meet. You see the telegraph poles, which also come nearer and nearer together. You see these same two shining bands of iron running on ahead, these same telegraph poles. This horizon travels with you until at last it is quite an item of excitement when you see a little lump coming up. You want to know what it is. As the train comes up you find it is quite large. As you approach still nearer you will find a large windmill to draw up water; and you find a little station, and alongside of that five or six soldiers to impress the Indians with the power of the United States army. But you leave the station, after you take up your water, and finally it sinks down below the horizon precisely as a ship does at sea. You follow this course hour after hour—all day. You wake up the next morning, and you are in a little rougher country. You get to Cheyenne. You see a long peak in the distance. You are told that is the Rocky Mountains, but you see no mountains, although in reality you are nearly 200 feet higher than Mount Washington. You see no mountains, except in the distance; supposing we are south of Denver, and you start north on the stage. There is a railroad up there now on which to go to Denver. The road follows along up here [indicating it on the map]. The plains come up to the base of the mountains, and that portion of the Rocky Mountains is perfectly well defined. It seems to me that the plain comes up to the mountains, as plainly defined as the floor to this platform.

With the foot hills the mountain character instantly begins. There is scanty tree vegetation. You are traveling north from Denver toward Cheyenne. When you get along upon some of these places, along up here [indicating it on the map], you see north of you a black line lying against the horizon, which, as you go north, keeps looming up higher and higher. At last it seems like a gigantic railroad embankment which you can see thirty

miles away. You have been watching the mountains all the time on the left. As you left Denver there they were rugged. Here are these great peaks with patches of snow on them glittering in the morning sun. North of Long's Peak they change in character. They are not so high. The tops are round. They seem to be made of softer material. They have yielded to rains. But just where they are getting the lowest you come to this great embankment, and that is just what it is, an embankment which stretches out between the North and South Platte. The plain rises to meet the mountains, and the mountains sink to meet the plain, until a man cannot tell when he leaves the plains and when he meets the mountain. "Uncle Sam" could not tell, when he paid for the railroad. As you are all aware, the engineering difficulties did not exist in the Rocky Mountains. The troubles of engineering lay in the mountains west, the Wasatch and Sierra Nevadas. The measurements I have spoken of were taken in 1869. Professor Whitney took out three or four students from the mining school of Harvard College. I went out with them. We were well supplied with instruments to do the work completely, and we did it as completely as though we were under pay. We made the survey as complete as government surveys are; and with the charm that there was no "red tape" about it, as we paid our own bills and were perfectly independent.

We took out six or seven barometers, four chronometers, a portable astronomical transit and a small transit, theodolites, and everything necessary. The scene of our explorations was the region of South Park and the head of the Arkansas Valley. We wished especially to examine South Park. San Louis Park, the largest of them all, lies further to the south.

Next, a word about South Park. That is the most beautiful of them all. Imagine an inland lake thirty miles wide and between forty and fifty miles long, perched

up high among the mountains, 10,000 feet, with mountains about it on either side 13,000 and 14,000 feet high, and grand old glaciers coming down about it, the glaciers and rains wearing the mountain's side. Finally, the lake is filled up, leaving a grassy plain. The ridges which ran down into the lake become as would ridges running down into a grassy plain; and that is what it is — an old lake filled up, nearly fifty miles long, with little tongues of ridge running down in it, with high mountains around about the outside, between it and the great plain a mass of rugged mountains made up of *gneissoid* rock, the streams which run through it cutting deep canons through it. That is the prettiest of the parks. Middle Park is neither so large nor so smooth. It is made up of round hills. This front range of foot hills is the range in which the most of the mining regions of Colorado are found, although further north the mines extend clear back of the crest. I dare say, when the country is fully explored, mines will be found scattered through as far as these metamorphosed rocks extend, and such rocks make up the most of the chain.

The tree vegetation is entirely of cone-bearing trees. You see pictures in the papers of that portion of the Rocky Mountains, and you find oaks and other deciduous trees there represented, but they do not exist in reality. Oaks, anywhere in that part of the Rocky Mountains, are unknown. No botanist has ever brought back so much as a leaf or an acorn from there. The only hard wood is a species of alder; but in the mountains are the spruce and pine. The magnificent firs of California do not occur. They are made up of comparatively small trees. We have here pretty large forests, but not at all comparable with those we find in California. The upper edge of the timber line is well defined at about 11,000 feet. Some of you may be wanting to go out there on a pleasure trip, and would like to know about the game. Well, there is an abundance of game. The

mountain buffalo is about extinct. They formerly ranged quite abundantly, but the miners have come and have driven them out of the country. I am now speaking only of that portion around the parks. Deer are quite abundant—an occasional elk. We saw three, I believe, in six weeks. Grizzly bears are a little more plenty, though nothing like so large as those in California. Those we saw I did not wish to disturb. Indians, ditto. There is a good deal of game there for those who are fond of shooting: turkey, grouse of various kinds, and the streams are filled with trout, looking at men as they go by and almost asking them to drop a line.

But if you have a taste for entomology, and are there in the season, vastly more abundant than all else are flies, more rapacious, biting to an extent—I dare not tell you how bad, setting your animals frantic, provocative of profanity among the men. They are *extremely* numerous. If you kill one it does no good, a thousand will come to his funeral, and hold a “wake” with music, and feasting upon the luckless victim. They are really the most serious drawback in the Rocky Mountains through a portion of the year.

A word now about one or two of these peaks in detail. Here is Mount Lincoln. Here is the park, numerous streams running down into it. When I spoke about oaks, I should have mentioned, that one deciduous tree or bush does grow there—the “trembling ash,” as it is called there. And in these little groves is just the place to shoot deer. The Great South Platte takes a detour down to Pike’s Peak, and rises here between Mount Lincoln and Quandary Peak. Just at the entrance of the park, following down the river, is a town; it used to be called “Fair Play.” A great many miners went in there, and whether it was not considered just the best name I don’t know, but it is now called “South Park City.” All through the Rocky Mountains you have evidence of a grand system of local glaciers in former times, but they

have entirely passed away, leaving only their *moraines*. I saw no *moraines* in Switzerland so finely developed as those in the Rocky Mountains. Passing up this valley you get a great many picturesque views. You come to "Buckskin," formerly "Buckskin Joe," and "Montgomery," two mining towns quite noted a few years ago for their mining wealth. I shall not describe those towns now. To use a California phrase, they are "played out." Buckskin Joe, which had its four or five thousand inhabitants, its theatres and banks, polled twenty-three votes at an election, just before we were there. There are still standing in the town of Montgomery seventy houses. It polled one vote, at the last election, and he had to go over to Buckskin to vote. The miners supposed mines of great wealth lay all around there, and so they built their houses. They began to dig holes, but finding that the anticipated nuggets were not there they abandoned the town. We camped in Water street, at the corner of Main street, and took possession of a store—a room as large as this—with a sign up, "positively no trust." We built our fire in front of the store to cook our provisions, for of course we took the proper equipments for camping. We did not take a tent up there, however; that was unnecessary. We went foraging around. Several fellows brought in chairs, and we soon had everything luxuriously. We found no provisions abandoned in that way. It was a curious place. Here a big sign, "Rocky Mountain Market;" there was the "Eldorado Hotel." Unlike most mountain places there were several saloons there. There was also a sign waving to and fro in the wind. It was a barber's shop; precisely whom to shave I don't know—miners rarely shave—perhaps eastern capitalists.

But although the town is deserted we found one house occupied by a most hospitable man, and from him we got all our information. The people who had built the town had built a good road up to it. I mean by that, passable

to a wagon. You could ride your horses up to above timber line. We made the ascent with comparative ease. It is about 14,000 feet, and, being the highest of any there, it gives the widest view. There is a similarity of views from all these peaks, but no two are alike. From this we look down on one side on the South Park. We look over into the valley into the head waters of the Arkansas; but it is in this direction — north — that we have the grandest view, and the highest landscape. Some matters may interest naturalists here. On nearly all of these peaks, to me the most interesting feature of animal life was the grasshopper. They occur in enormous numbers; and when you ascend one of these peaks on a warm day, in the right season, you will find grasshoppers as far up as you can see. We were up there on a very warm day. I lay down on my back. Now I suppose most of you are aware that if you look up into the sky on a warm day and have the sun screened from your eyes by the corner of a building you can see insects in the air. Here I could see numberless crowds of grasshoppers in the air. They fly up on the mountain, and if they alight on the snow they get chilled and cannot get away; and when the snow disappears in the summer the carcasses are exposed, making a stench which is positively unpleasant. I was a little amused by one thing about it. On the coast of California we used occasionally to come across a dead whale. That smell once smelt will never be forgotten. It is very considerable and very peculiar. Now, I had as my companion Mr. Hoffman, who had been in California with me on my former trip, and the first time he came to the place he sniffed the air, and finally sung out, "dead whale!" and I don't know anything else to which I can compare the stench of these grasshoppers except dead whale. It had precisely the same flavor. If any of you go up the Rocky Mountains after smelling dead whale you will notice the similarity at once.

Bottle flies are quite abundant on the sunny slopes.

In some respects these mountains down here are more interesting [pointing to Mount Yale and vicinity]. They are more rugged. Arkansas Valley lies more than 1,000 feet below South Park. From what I have said you have no grand slopes in the Rocky Mountains like these the Sierra Nevadas, because the base is so high. At Mount Shasta you have 11,000 feet lying before you in grand slopes. Not so in the Rocky Mountains. You have no such slopes. It is very rare that you get a slope of more than 4,000 or 5,000 feet. Enough you may say for an ordinary climbing, but nothing like the California Mountains. I did not ascend Mount Harvard, but I was on Mount Yale, which is the sharpest, from Arkansas Valley, doing so after quite a fatiguing trail, and obtaining upon the whole rather a more picturesque view than from Mount Lincoln. The summit of these peaks is generally made up of splintered rocks that have been shivered by the frost. Between them you can occasionally find mosses growing as high up as 13,000 feet; snow banks lie around in large masses, differing in different years, for the amount of snow that falls is very capricious. Occasionally you come across patches of snow of a red color, tinged by a small plant which may occasionally be found in the snow in the Alps. I have examined it on numerous high peaks of the Rocky Mountains. Streaming down between Mount Harvard and Mount Yale is a stream which was once a glacier of magnificent form. I rode up alongside of one of the boulders on the *moraine*, and, dismounting, measured it. It was twenty-five feet high.

One feature of all these peaks is the stillness. What is there to make a sound up there? Nothing but the winds or the echoing sounds of the streams below. On a peak 14,000 feet high the barometer stands generally about eighteen inches. The breath comes quick and fast. The pulse is ninety, one hundred, one hundred and ten. The sensations are not so unpleasant as we generally hear



them described. The principal difficulty is a lack of what you call wind, in climbing. To ascend a slope 2,000 or 3,000 feet high a man puffs considerably. It seems as if the thin air refused to sustain him. The *dangers* of mountain climbing it seems to me are erroneously exaggerated. I have ascended many high mountains, and yet I can tell of no narrow escapes. It is a very different story. It is a story of hard work ; unromantic hard work. Getting up a slope requires sometimes forty or fifty hours of hard work, sleeping out in snow and rain, eating provisions which you would not eat at Delmonico's, to say the least, and not always enough of them. It is unpoetical hard work. Richly paid you are, to be sure, when you get to the top, but I did not lose my scalp, I tumbled off no precipice, though I came pretty near it a few times.

But what is the most necessary for a successful mountain explorer is good, strong muscles, powerful lungs and a stout heart, because, strangely enough, persons are troubled with palpitation of their heart if it is at all affected. One needs, also, a certain amount of zeal. You must feel that it is going to richly repay you, or you will hardly do it.

There is one more peak that I will speak of. If any of you visit the Rocky Mountains, the best peak for the ladies to visit, and the most magnificent peak, with the least labor, is Gray's Peak. Here [pointing to the map] is the city of Denver. Near it comes in Clear creek. Along it are the most prosperous mines of Colorado, and the most prosperous mining towns. Georgetown lies about here, and in Georgetown you will find good hotels. Stages run every day. We had rooms with wash-stands in them, and looking-glasses ; why, it was quite palatial. From Georgetown it is only fifteen miles to Gray's Peak, and a wagon road runs up to above the timber line, to within three miles of the summit. At an elevation of over 11,000 feet there is Baker Mine, with houses where

you can find accommodations — accommodations upon the floor ; still, that is a considerable item. The first time we were on Gray's Peak we crossed in a snow-storm. In the Rocky Mountains we have a shower every afternoon, and attending them are the most marvellous atmospheric effects I have ever seen anywhere — the cloud effects. I have never seen anything to compare with it. The variety of cloud-colors and effects produced by cloud and storm is positively beyond description. When we first made the ascent of Gray's Peak, a fog came on and enveloped us before we got to the top. We were detained on the Peak four hours. We stood on the crest, or watershed, the waters running to the Atlantic on one side and to the Pacific on the other, from an elevation of 14,145 feet. During this snow-storm, which was really the afternoon shower in the valley 1,000 feet below us, we could hear the thunder all around us ; then came back the echoes from below. It finally cleared away by the clouds sinking, thus leaving us above them. Below us it was snowing still, and the fierce wind caught the snow and whirled it over the Peak in our faces, and it went down into the fog, which resembled a seething caldron below. I tore off some oil-cloth to wrap my instruments in, and the next day made a second ascent. We were at the top by nine o'clock, and remained there six hours ; and, I assure you, we were richly repaid. The Peak is about fifty or sixty miles from the plain. From the point we started, only three miles distant, we supposed it was perfectly cloudless, but on going to the top we found it was not cloudless. On looking out toward the plain, we saw clouds stretching away off to the distant horizon ; but they were at a lower level than we were, for the plain lay about 9,000 feet below us. A portion of this 9,000 feet was occupied by clouds. However black clouds are below, they are always white on the top. They must be, for their tops are in the sunlight. They glisten like silver. To the north-west was, as you will perceive, Middle Park.

First it was filled with fog, and, as we looked down upon the top, it was like a great lake. After a time the fog went away, and we saw the rough hill and landscape within it; but by far the roughest portion of the landscape was between the south and west—in this direction [pointing it out]—extending off to an unknown distance into that *terra incognita*, nameless, untrodden, unknown peaks, some of them grand and lofty, glistening in the sun.

Sopris Peak is, possibly, the highest peak in the Rocky Mountains; but I don't know. We have no peak as high as Mont Blanc, with the single exception of Mount Shasta. All the peaks lie between 14,000 and 14,300 feet high. There is Mount Lincoln and Pike's Peak and Mounts Yale and Harvard that are that height, and a great many others that come up near those figures. When you are up on any one you think you are on the highest. Now, this is a thing which cannot be accidental: there must be a great law which regulates it. Sopris Peak many suppose to be the highest there; but no one has measured it. The Mount of the Holy Cross is perhaps 14,000 feet; but I do not know that. It takes its name from two ravines filled with snow, which have something the form of a cross, 1,000 feet long. As it came toward noon the storm began to come up, and you could see storms in the mountains over twenty miles away, and hear the distant thunders. Imagine the ocean suddenly frozen in a storm, and every wave magnified from its tiny height to many thousand feet, and every crest a snow bank, and you will have something the appearance of this wonderful mountain range to the west of this peak. You may ride a horse to the very top of it. You may sit upon your horse on the summit of this crest, 14,000 feet high. A miner by the name of Irving supposed there were valuable mines near the top of these peaks; and at the same time the man must have had a most realizing sense of the beauties of the place, for he constructed, at enormous labor and great expense, a

good trail, by which you may ride to the very summit. He erected a tent upon the top of one of them, and shreds of canvas are still fluttering in the wind where he used sometimes to spend the nights, and could have all the beautiful landscape about him. We had to thank him for this trail, for it made the mountain accessible to us. The second time we were up there, it chanced to be Sunday, and among the visitors who came up were four ladies, two of whom had on cloth shoes. I mention it to show how accessible the peak is. From its top you can have a view which is hardly surpassed by any on the Rocky Mountains. You look down into both parks. You look out on the great plain. You see this little-known country along the Grand river. I am fully convinced that when you reflect upon this and compare it with Switzerland, with all its scenic effects, you will conclude that it is not necessary to travel over foreign countries to see high mountains and grand scenery. We have shown you the size of Switzerland. It has but six peaks over 14,000 feet high. From Gray's Peak you will see more than that number with one glance of the eye. You perceive how accessible it is, attended with absolutely no danger. Why, you can ride a horse to the very summit, and buy the horse, for that matter, at not a very dear rate. When all this is appreciated, I am sure that those who have been inclined to voyage across the ocean, and visit other lands, will turn their attention to our own beautiful country, which has so much more of the sublime, so much more of that which delights the eye of man !

## V.

GEOGRAPHICAL DISCOVERIES IN THE ARCTIC  
REGIONS.

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Letter by Capt. C. F. HALL to Chief Justice DALY.

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WASHINGTON, April 9, 1871.

To the Hon. CHAS. P. DALY,

*President of the American Geographical Society :*

DEAR SIR.—Continued occupation since my return has prevented me from giving you, as you requested, an account, in detail, of what I have observed in respect to the geography of the arctic regions. With my first voyage you are sufficiently familiar, and I have nothing to add to what is contained in the volume published by the Harpers. During the last five years that I have spent in the arctic, I availed myself of every opportunity afforded me for accurate observation, and I give you the results. You will remember that *Wager Bay* is an old discovery of Middleton's, in 1742, when he was in search of a north-west passage. The general outline or rough sketch then made remains unimproved to the present day. I explored this inlet for sixty miles, up and down, to its junction with Rowe's Welcome, and made a series of observations from astronomically determined positions. *Repulse Bay*, though visited by Middleton, and afterward by Parry and by Rae, still remains but imperfectly defined. I have, from my own observations, the data for a more accurate delineation of the outline of this bay. I discovered and surveyed a new inlet in latitude  $67^{\circ}$ , north longitude  $84^{\circ} 30'$ , a few miles north of Norman's creek, of which it may be said to be a counterpart, running from

Lyon's Inlet to the eastward. I may be excused for expressing to you the gratification I felt in making this discovery, remembering that Parry, in 1821, when exploring and surveying the opening, to which he gave the name of Lyon's Inlet, determined, as he says in his narrative, to leave no opening or arm unvisited; and yet, with all his care and the aid of his officers and four boats' crews, he overlooked the new inlet I found, from the fact that a high island shut out from his view the entrance to it. I discovered a bay on the west side of Fox Channel, latitude  $69^{\circ}$ , longitude  $81^{\circ} 30'$ , which makes west-south-west for fifteen miles. This Parry also missed, which is not remarkable when we consider that his was a marine survey along the west side of Fox Channel to *Ig-loo-lik*, an island near the eastern end of Fury-and-Hecla Strait. I discovered an important lake, twenty-five miles in length, in latitude  $68^{\circ} 45'$ , north longitude  $82^{\circ}$  west. I call it important, as it abounds in salmon of large size, some being six feet in length. It contains, also, many other species of fish, some of which, I think, have been hitherto unknown. Also, another lake, latitude  $69^{\circ} 35'$ , running parallel with Fury-and-Hecla Strait, about fifty miles in length. It has two outlets. I followed up Crozier's river, the mouth of which Parry discovered, and found its source to be the lake described. At the west end of the lake is another outlet forming a river, which I followed down to the Gulf of Boothia, where the river discharges itself into a fine bay—another discovery. It fell to my lot, also, to ascertain the north-western part of Melville peninsula, at and below the western outlets of Fury-and-Hecla Strait, which may be said to complete the discovery of the American continent.

I discovered a long island, lying to the north-west and westward of the western outlet of Fury-and-Hecla Strait, and also the coast of the mainland on the north side of the above mentioned outlet of the strait, and I found that the "Jesse isle," laid down and so named on Dr. Rae's

charts as Admiralty Inlet. Nothing has been known, however, by civilized man of the extent of this bay or of its character. The entrance is from Barrow's Strait, latitude  $73^{\circ} 43'$  north, longitude  $83^{\circ}$  west, and the bay extends very nearly in a southern direction to about  $71^{\circ}$  north latitude. The west side has a coast line on a gradual curve from Barrow's Strait to near its limit, the concave on the east, whilst the west side has many bays or fords, with some good harbors in them. The bay is free from ice every summer, and none of the ice from Barrow's Strait ever finds its way into it. This bay abounds in whales (*Balæna Mysticetus*, or smooth back, the most important to civilized man), in narwhals (the sea unicorn), and in seals. So abundant are the whales that the natives sometimes kill, in their rude way, as many as five large ones in a few days. The information I derived from the Esquimaux has convinced me that this new bay will prove as valuable to whalers as Cumberland Sound. From 1840 to the present time the product of whalebone and oil from Cumberland Sound, by English and American whalers, has amounted to \$15,000,000; and as the area of the whale fishery is gradually diminishing, the fact of the existence of this bay I regard as of great value, as opening up a new ground for the prosecution of this important industry.

I also obtained valuable information from the Esquimaux at Ig-loo-lik respecting *Pond's Bay*, the western prolongation of which, upon our present Arctic charts, is miscalled Eclipse Sound. If the testimony of the Esquimaux can be relied upon, and I place the fullest confidence in it, Pond's Bay terminates in longitude  $81^{\circ}$  west (approximately); and the representation upon the Arctic charts of a strait from Pond's Bay to Prince Regent's Inlet, on the northern part of the Gulf of Boothia, is erroneous.

It has been the supposition of geographers that Davis Strait and Baffin's Bay are connected with Fox's Chan-

nel by straits. This is not the fact. All the intelligent Esquimaux that I have met in my two voyages assert that the land, bounded on the north by Barrow's Strait, upon the east by Baffin's Bay and Davis Strait, on the south by Hudson's Strait, and on the west by Fox's Channel and Prince Regent's Inlet, is one land, or *one great island*. They know of a much smaller island that has Pond's Bay on its south side, Navy Board Inlet, or more properly strait, on its west, Lancaster Sound on its north, and Baffin's Sea on its east side.

My other contributions to geography are, that Dr. Rae's Colville Bay, in latitude  $68^{\circ}$  north, longitude  $88^{\circ} 20'$ , is not a bay, but very low land; that his Grinnell Lake and Simpson Lake, which he delineates as one continuous lake, are, in fact, three distinct lakes; and, lastly, that his "*Shepherd's Bay*" extends northerly about twelve miles beyond the limit he has assigned to it.

This, my dear sir, embraces all I have to communicate. You will remember that I went out with very limited resources, and was more circumscribed for the want of means than almost any Arctic explorer. Should I again go out, as I trust to do, I hope to extend the area of geographical discovery and accomplish something that may redound to the credit of our common country.

Very respectfully yours,  
C. F. HALL.



## VI.

EQUATORIAL REGIONS OF WESTERN AFRICA,  
WITH MAP.

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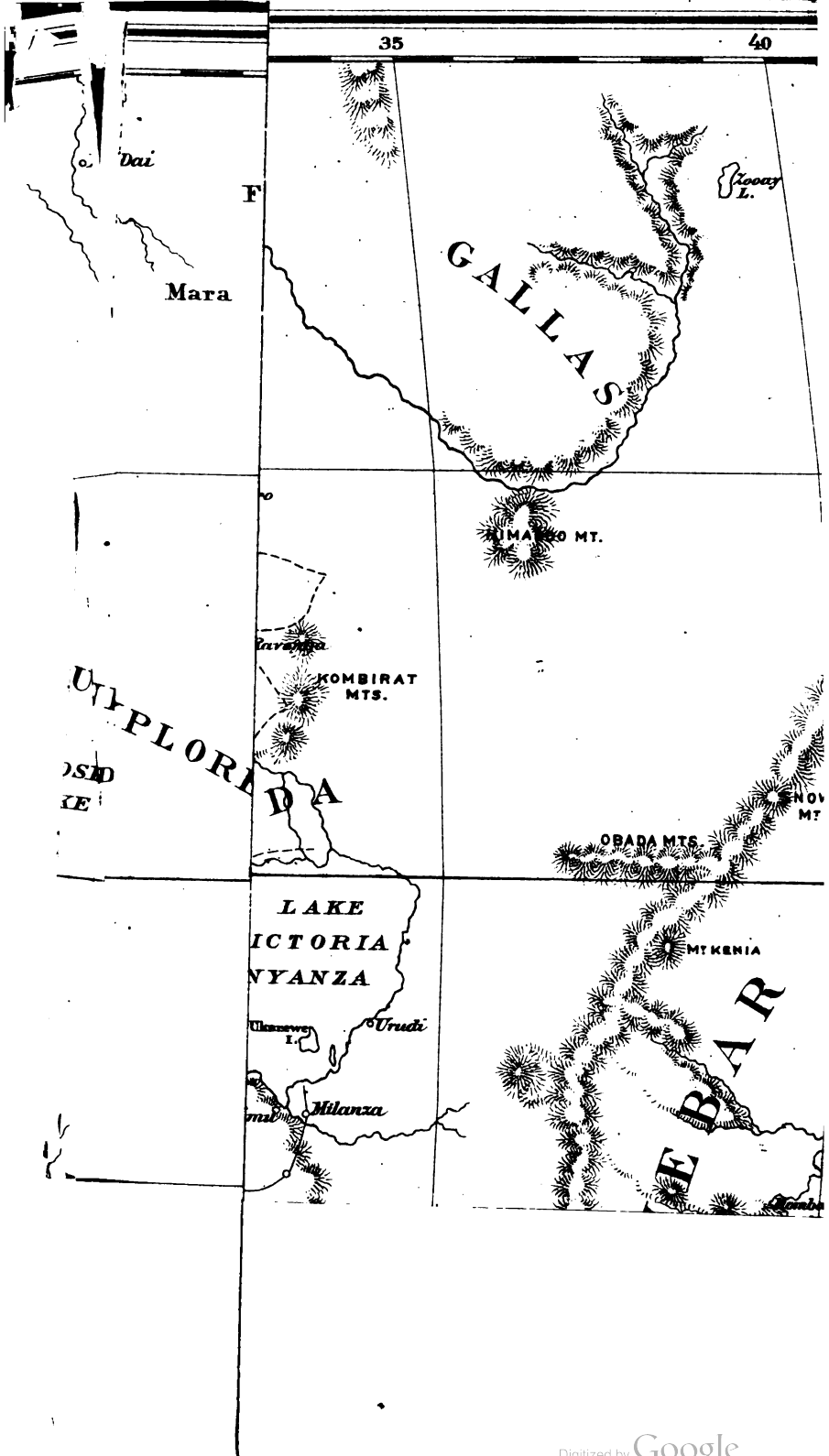
Abstract of a Paper, by Rev. ALBERT BUSHNELL, for twenty-seven years  
a Missionary at Gaboon, Western Africa.

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READ MAY 10TH, 1870.

MR. PRESIDENT AND GENTLEMEN OF THE AMERICAN GEOGRAPHICAL AND STATISTICAL SOCIETY: A little more than seven years since, on the eve of returning to western equatorial Africa, which had been the field of my missionary labors during a score of years, I had the honor of reading a paper before your Society upon that interesting country. In the closing paragraph, the attention of the Society was particularly directed to the unexplored regions of Ethiopia, as an important and inviting field for geographical research, with the hope that, under its auspices, or through its influence, an expedition might be sent out from this country to assist in lifting the dark veil that continued to conceal that vast portion of the globe from the knowledge of civilized nations. It seemed meet that our nation, which, from its birth, had been so intimately, and, alas! often unrighteously, connected with Africa and her children, should participate with the nations of Europe in the philanthropic work of exploring her dark recesses, and of conveying to her benighted nations the blessings of Christian civilization, and also of sharing with them the valuable commercial advantages which it was predicted would follow the cessation of the foreign slave trade.

Although these anticipations have not yet been realized,





I am happy, on my return, to inform you that, through different agencies, the work of exploring has been gradually progressing, from various points—diminishing, every year, the *terra incognita*; rendering it morally certain that, at no very distant day, every portion of that vast land will be trodden by the feet of civilized men.

For the better elucidation of the subject, I have prepared and suspended before you a map of equatorial Africa, representing ten degrees of latitude on each side of the equator, and forty degrees of longitude, eastward from the meridian of Greenwich to the Indian Ocean. It is designed to present to the eye the extent to which explorations have been made—the foreign political establishments, the missionary stations, and the territory which remains to be explored. Through the indefatigable labors and sufferings of a succession of heroic explorers—from Mungo Park, who perished on the Niger in 1805, down to the present—the extensive countries lying between the Sahara and the equatorial regions have been explored, their rivers traced, their lakes and cities generally visited. Eastern equatorial Africa has, by missionaries and travelers, been pretty well explored as far west as the system of lakes, which form a grand characteristic of that portion of the world.

From the earliest periods, the sources of the Nile have been indefatigably sought after, and not unfrequently it has been supposed that the great problem had been solved. But the recent researches of Speke, Grant and Sir Samuel Baker, with his heroic wife, have thrown new and important light upon the subject. For a time, it was pretty generally admitted that the twin lakes, Victoria Nyanza and Albert Nyanza, were the long sought-for sources of that wonderful classic stream. But more recently, that prince of explorers, Dr. Livingstone, when last heard from at Ujiji, on the eastern shore of Lake Tanganyika, had almost demonstrated a connection between that and the Albert Nyanza, making the real

sources of the Nile the streams which flow into the Tanganyika from the south in latitude from  $10^{\circ}$  to  $12^{\circ} 5'$ . The western portions of equatorial Africa have, during the past quarter of a century, been more minutely explored than the eastern portions, though not so far back from the coast, except in the vicinity of the Niger. Between the Niger and the Congo, our knowledge extends from 150 to 300 miles into the interior, leaving a territory about 1,200 miles square yet unexplored, concerning which we have no certain knowledge.

But notwithstanding our acquaintance with the western coast of equatorial Africa is confined to a narrower range than that of the eastern portion, it is not less interesting and important. It has its noted rivers, the Niger and the Congo, with numerous intervening streams, several of which, though short, are broad and deep, like the Gaboon, which is eight miles wide, with a safe anchorage, sufficient to accommodate all the navies in the world. It has its mountains, insular and continental; Fernando Po, Princess, St. Thomas and Annobon, are a range of mountainous islands, with scenery rarely surpassed. On the main land, the Qua Mountains, Sierra del Crystal, and Cameroon, the latter rising 14,000 feet, and sometimes snow-capped, present some of the grandest scenery in the tropical world.

Eastern equatorial Africa has its magnificent system of lakes, which mighty reservoirs supply the Nile and enrich Egypt. We are now almost certain that similar interior lake reservoirs exist on the western side, from which issue probably the Ogobai, the Congo, and possibly even some of the western sources of the White Nile. Of this, we have during several years had surmises; and accumulating evidence, through native sources, has now removed all doubt. We suppose that between the highlands, which extend from the Cameroon to the equator, near the western coast, and the mountains that skirt the western borders of the Albert Nyanza, there is another

lake or lakes, the western borders of which may be found within 500 miles from the mouth of Gaboon, a little north of the equator. Although American missionaries, English traders and explorers, and French naval officers have made repeated efforts to reach this lake region during the last few years, they have thus far been unsuccessful, and our conjectures in reference to this interesting subject are based upon native reports.

Surprise is often expressed that the progress of exploration from the western coast has not been more rapid. But it should be remembered that most formidable obstacles have impeded this work ; and many difficulties still exist. With the exception of the Niger, and its southeastern branch the Benue, which have been explored ; there are no navigable rivers extending far into the interior. The navigation of the Congo is interrupted by cataracts some seventy miles from its mouth. The same is true of the Ogobai. The Gaboon, Moondah, and Mooney are comparatively short.

Until recently, the foreign slave trade has prevailed in most of this section ; and the maritime tribes have been almost constantly engaged in war with each other to obtain victims for the barracoons of the slavers, causing a hostile line of tribes between the coast and the interior, which it was difficult and perilous to attempt to pierce. The most persistent opposition has also been met by every explorer from the kings and chiefs of the native tribes bordering upon the unexplored regions. They are willing, and often desirous, to have white men visit them ; but will use every means in their power, foul and fair, to hinder these from passing beyond them, lest their interior neighbors should gain knowledge or strength from which their trade or other interests might suffer. But now that the slave trade has ceased, and the hitherto belligerent tribes are engaging in peaceful commerce, which is fast attracting the interior people toward the coast, and the facilities for exploring are greater than they have ever

been, we confidently believe that the work so long impeded and delayed will be, ere long, consummated.

Here lies the largest unexplored portion of the globe; and he who shall first succeed in traversing it will win immortal fame, enrich science, and confer inestimable blessings upon Africa and the world. A French naval officer who recently ascended the Nile to Gondokoro, with the design of crossing the country from the Albert Nyanza to Gaboon, perished in the attempt. M. Du Chaillu, whom I am happy to meet here, a few years since visited Ashango Land, was compelled to retrace his steps, without accomplishing his ardent wishes; and now comes the report, which we deem incredible, that the heroic Dr. Livingston, proceeding from the Tanganyika to the western coast has met a tragic death. We may still hope to hear from this remarkable man, and perhaps for him is reserved the honor to accomplish the grand achievement to which I have referred.

The temperature of this part of Africa is not as high as might be supposed, the thermal equator crossing the coast several degrees north of the line.

The climate of all this region is malarious, and at first proved fatal to not a few foreigners connected with commercial, exploring and missionary enterprises; but increasing sanitary knowledge, and the improvements introduced by Christian civilization, are every year rendering it less and less perilous. Persons of suitable constitution may, with proper care, endure many years and accomplish much labor; but still it is not the normal climate for white men, and the country will never be extensively settled by them. The French government have a colony at Gaboon, which has become a valuable naval station; the Spaniards have an establishment at Fernando Po, the terminus of the English lines of steamers, and the English government have a colonial establishment at Lagos. All the other places on the coast and ports on

the rivers are still under native control, and are free to vessels of all nations.

The soil of equatorial Africa, with the exception of sandy regions near the sea, and marshy jungles near the rivers and lagoons, is fertile and capable of producing most of the tropical productions ; but the majestic forests are generally yet unbroken, and only a small portion of the land is under even the imperfect cultivation which the females and slaves bestow upon it. They have no horses or cattle, or other beasts of burden, the elephant not having been domesticated ; but in most of the villages may be seen fowls, and flocks of goats and hairy sheep. The grand old forests abound with herds of elephants, in the capture and slaughter of which the native hunters display much courage and skill ; their bodies are eaten and their tusks form an important article of trade. The lion is nowhere found in this region, but leopards abound. Antelopes of various species are common, and almost every variety of the monkey tribe, including the anthropoid gorilla, are denizens of the forests and jungles. The country is rich in flowers of brilliant colors and birds of gaudy plumage. Serpents of enormous size, and poisonous reptiles and insects, annoy and sometimes imperil human life. As there are no good roads, or facilities for land travel, journeying is mostly on the numerous rivers, creeks and lagoons, in boats and canoes, in the manufacture and management of which the natives show no little skill.

The western Ethiopan tribes are nations of traders. While they are averse to agriculture, for traffic they have a passion, and in it they are shrewd and active. During generations past, many of them have been employed by the foreign slave traders as factors, to obtain by purchase, theft, or war, victims for their horrid piracy. This nefarious business developed their worst passions, and destroyed in their minds the sacredness of human life. Vast regions were desolated, and some whole tribes were obliterated,



while others remained only in scattered remnants. While this traffic remained, there was but little desire for any other. It was easier, and more congenial with their savage natures, to capture and sell a fellow-man than to kill an elephant or to labor and develop the resources of their country. But nearly simultaneously with the close of our late war and the extinction of slavery in the United States, the slave trade, Africa's chronic scourge, ceased. A wonderful change is now everywhere apparent. The Ethiopian now stands up in his manhood, and no longer regards himself and his race as chattels. Hundreds of thousands of the people are industriously engaged in developing the riches of their country to exchange for foreign manufactures. In their native state, their necessities were few and easily supplied; but the introduction of Christian civilization increases their wants and stimulates them to industry and enterprise. This is rapidly developing the valuable products of the country so much needed in civilized lands, and, at the same time, furnishing a vast market for the surplus manufactures of Europe and the United States, from a cambric needle to a cooking stove. The bark cloth with which they were formerly clad is being exchanged for cotton fabrics, muslins, and silks, and ready-made clothing of the latest style, for both sexes, find a prompt sale. Bamboo huts are being exchanged for comfortable dwellings—in some instances constructed from lumber exported from this metropolis. These houses must be furnished with chairs, sofas, mirrors, Yankee clocks and other costly furniture. As an index of the progress of civilization, I will mention that soap, that great civilizer, is coming into general use. Twenty-five years ago, American missionaries at Gaboon discovered the Indian rubber, and indicated the trade which has become vast and lucrative. Its production furnishes profitable employment for multitudes of the natives—men, women and children. The palm groves of the jungles are furnishing oil of great value in large

quantities. The ivory, ebony and bar-wood are brought from the interior, and, as soon as railroads and other means of conveyance are provided, the quantities will increase. As Christian civilization advances, additional useful and valuable mineral and vegetable discoveries will be made, rendering the commerce of equatorial Africa unsurpassed in richness. Already the steamers of several lines from Great Britain and the continent pass up and down the coast each month, loaded with freight and passengers. It is to be regretted that our government has left Europe to reap the lion's share of the commercial advantages of this country, by delaying to establish a line of steamers to western Africa. While commerce is stimulating the maritime tribes of equatorial Africa to activity, it is a sad fact that the intoxicating drink which it pours in upon them is desolating the country, and, in some places, almost decimating the population. Would that merchants engaged in trade with these benighted tribes could see that it would be for their own interests, as well as for the good of the people, to refrain from sending out poisonous liquors, which the excitable Ethiopian cannot use with impunity.

Among the different tribes and nations of equatorial Africa there is considerable diversity in color and physical appearance, and in social life. Yet, in many respects, there is a similarity. Those who have most recently descended from the highlands of the interior are of a lighter tinge, and are physically superior to those who have long resided upon the low, malarious regions of the rivers and lagoons near the sea. The interior people, also, are more independent, courageous and warlike, and also more ingenious in the manufacture of warlike implements from the ore they dig from their native hills, and of spoons and dishes of wood, and mats and cloth from rushes and the bark of a tree. They have been more dependent upon their own manufactures, while

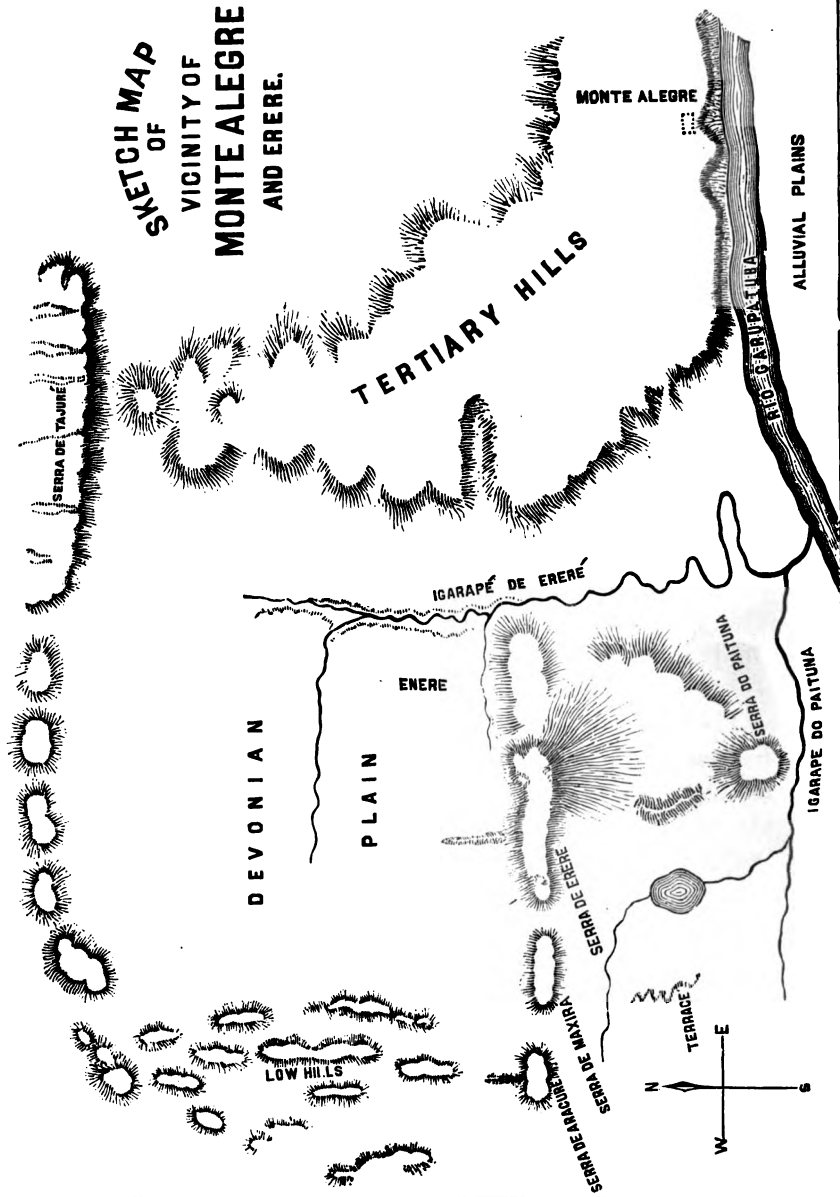
those near the coast have relied upon commerce to bring them foreign manufactures.

No people in the world are more teachable and imitative—none more susceptible to intellectual, social and moral improvement—than these Ethiopian tribes. This has been demonstrated among different nations with whom missionaries have lived and have labored. They display remarkable linguistic abilities. Not unfrequently men are found, near the trading ports, who, with no knowledge of letters, speak, intelligibly, several European languages, besides a larger number of native languages; and, with no knowledge of figures, will correctly transact business to a large amount.

They may never develop Anglo-Saxon mental strength; but they are quick, ingenious, impulsive and enthusiastic; passionately fond of music, poetry and the beautiful, and capable of rising to a high and luxurious type of civilization. The past of Africa has been dark and afflicting, but a bright future is before her. Ethiopia is even now stretching out her hands unto God, and the sun of righteousness is rising upon her benighted millions with healing in his beams.



**SKETCH MAP  
OF  
VICINITY OF  
MONTE ALEGRE  
AND ERETE.**



## VII.

RECENT EXPLORATIONS IN THE VALLEY OF THE  
AMAZONAS, WITH MAP.

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BY CHAS. FRED. HARTT, M. A.,  
Professor of Geology in Cornell University.

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READ MAY 16TH, 1871.

## ON THE PHYSICAL HISTORY OF THE AMAZONIAN VALLEY.

The history of the Amazonian Valley anterior to the Devonian is involved in much obscurity. It first appeared as a wide strait between two islands or groups of islands, one now forming the base and nucleus of the Brazilian plateau, the other, on the north, the plateau of Guiana. These islands made their appearance at or shortly after the beginning of the Silurian age. At this time the Andes did not exist.

The rocks of the lower rapids of the Tocantins, as far at least as the Cachoeira da Guariba, consist, in the main, of a thick series of more or less altered shales, sandstones, impure limestones, etc., highly inclined to the northward, and traversed here and there by trap dikes. These rocks have afforded me no fossils, so that I am unable to determine their exact age. They are probably, however, Silurian.

I have never visited the rapids of the Xingú; but Prince Adalbert, of Prussia, who in 1842 ascended that river to some distance above the first cascades, in company with the Counts Oriolla and Bismarck, reports the prevailing rocks of the lower rapids to be granite and gneiss, and the same observer speaks of the occurrence of clay-slate just below the last cachoeira.\*

\* In Brazil this term is applied to rapids as well as falls or cascades.

At the lower rapids of the Tapajos, as far at least as the Apuim, I found red sandstones, resembling closely our Potsdam Sandstone of New York, broken through, disturbed, and altered by immense dikes and masses of a coarse red porphyry, sometimes with very large crystals of feldspar. This sandstone is certainly pre-Carboniferous, as immediately below the last fall we find, undisturbed and unaltered, Carboniferous strata, which I shall presently describe.

In the vicinity of Monte Alegre and of the Serra do Ereré, undoubted Lower Devonian rocks, with an abundance of beautifully preserved and characteristic fossils, occur.

This region is so very interesting, on many accounts, that I will describe it somewhat in detail, and with the aid of a sketch map.

The mountains of Ereré form a group lying some eight miles west of the Villa do Monte Alegre, and about fifteen or twenty miles north of the main river Amazonas. The Serra of Ereré proper is a narrow, irregular ridge, four or five miles long, trending from east-north-east to west-south-west. On all sides it is very abrupt. On the north a broken line of craggy precipices runs along the edge of the Serra, below which the slope is steep and talus-like. This side of the Serra is extremely picturesque. The line of precipices is formed by beds of coarse sandstone, ordinarily very hard and of a white or reddish tint, which strata conform in strike to the trend of the mountain, and dip toward the southward at an angle varying from five to twenty degrees. The latter angle is the highest I have observed. The inclination is so great that in the precipices of the eastern end of the Serra it is observable from a long distance. On the southern side the mountain is very irregular, steep and often precipitous; but the top may be reached in one place by a long, sandy, inclined campo. The summit is so broken, rocky and irregular, that it is a difficult task to traverse the ridge from end to end.

From the description I have given of the Serra do Ereré it will be seen that it is composed of disturbed strata, and moreover that in this respect, as well as in its topographical features, it bears no resemblance to the flat-topped hills farther east, to which system it has, however, been referred.

To the south of Ereré is a much lower, irregular patch of the same strata, forming a sort of plateau called the Serra do Paitúna, beneath which, according to an Indian legend, an enchanted being of the same name has hidden himself. There the rocks, according to my young companion, Mr. Staunton, lie very flat. Both in the Serra and in Ereré, the strata, being often of unequal hardness and well jointed, have been worn into strange drongs, pillars and tables. A curious and very conspicuous mushroom-like table stands on the top of Paitúna, on the southern side, and bears the name Induá (mortar, *Tupi*), or in Portuguese, Pilao, from its resemblance to one of the huge wooden mortars so commonly used in Brazil.

In some places the rock has been excavated, forming caves, and, a large bat-inhabited grotto, situated most picturesquely on the side of Ereré, among the crags, is called by the Indians, Tupaóca; literally, "God's House," or the church.

Westward of Ereré, and separated from it by a deep notch, is a short ridge of the same general character and geological structure, called the Serra do Maxirá; and beyond this, a short distance to the westward, is a similar hill that appears conical when seen from the east. It bears the name of Aracurí. I have not visited it. The only fossils so far found in the Ereré sandstones are fragments of fossil wood, which, when examined, may perhaps aid in the determination of the age of these strata. These remains were found by Mr. J. B. Steere, who accompanied me on my last visit to the mountain, in 1872.



From the northern side of Ereré, a very narrow, sharp, wooded ridge starts abruptly from the Serra and extends northward for a mile, more or less, with an even height of 150 feet or more. It is then cut through by a gap, on the other side of which it continues in the same direction for some distance. In the gap, the lower part of the ridge, to a considerable height, is seen to be composed of a heavy mass of diorite, but whether it forms a bed or a dyke, I had no means of determining. A road passes through the gap, and is much gullied out by rains, exposing a great abundance of boulders of decomposition, which might readily be mistaken by a superficial observer for erratics.

The top of the ridge appears to be composed of a rather compact, not well laminated clay rock, mottled red and white, and without fossils, the beds dipping at a moderate angle to the west. A similar ridge appears to be attached to the hill Maxirá, but an attempt to examine it proved a failure, as I lost myself in the thick woods.

From Maxirá and Aracurí there extends northward a narrow zone of low, wooded ridges, which gradually bends round and culminates at a distance of fifteen to twenty miles to the north-north-east of Ereré, in the high and beautiful ridge of Tajurí.\* Of this zone of high lands between Maxirá and Tajurí I cannot give an intelligent account, owing to the want of sufficient exposures, and of the difficulty of recording accurately observations made in a tangled forest, and in the beds of the extremely tortuous igarapés† (brooks) which one is obliged to follow.

This hilly region appears in the main to be composed of the same mottled clay rock above described; but I have found also shales, some of which are finely lami-

\* Often written Tajury. The Tupí name appears to have been Tauáyurí.

† Literally, canoe path, a term applied on the Amazonas to all small streams, whether navigable or not. *Ygára* is canoe, and *pé* path. *Ygára* appears to be derived from *yg*, water, and *yára*, lord, master; whence *ygaraapé* (*igarapé* Portuguese form) would mean, *path of the lord of the water*.

nated, and of a dead black color. Numerous dykes of trap intersect these rocks and are exposed in the beds of the igarapés. Here and there are heavy superficial deposits of hæmatite ore, more or less impure.

Attempts were made by Mr. Herbert H. Smith and myself to reach a high hill north of Ereré, but the thick and tangled undergrowth, full of Yurupari-pindá (Devil's fish-hooks) and other thorny plants that cover its vicinity, prevented our reaching it. I found a sort of plateau lying in front of the mountain, in part at least composed of diorite, like that of the ridge near Ereré.

Tajuri is a fine, sharp crested monoclinical ridge, trending approximately south-east and north-west. The upper part is composed of a series of shales, sandstones and clayey rocks, barren of fossils and very different from anything I have seen elsewhere. They dip to the north-east at an angle of about twelve degrees. The lower rocks of the series I did not see exposed.

Toward the south-west the Serra is very steep, almost precipitous, a line of low bluffs running along near the top indicating the position of a bed of sandstone. To the north-east the mountain slopes off at an angle of ten to fifteen degrees, in a series of beautiful grassy campos, interspersed here and there with trees. This side of the Serra is scored by deep ravines formed by pluvial torrents. In many cases these gorges have extended up to and even through the crest of the Serra, causing it to present a notched outline.

At the base of the mountain, at the eastern end of the Serra, are beds of a compact bluish limestone that looks as though it ought to contain fossils, but none were found by myself or party. The locality, Jacaré by name, merits further study.

From near Tajuri to Monte Alegre extends a series of broad, swelling ridges, the remnants of the formation of table-topped hills, which I will describe more fully further on. These heights, together with the Serra of Ereré,

and the zone of hills extending thence to Tajurí, form, topographically speaking, a rim to a great plain, that extends up to the base of the hills, on all sides.

Thus far, in our examination of the Ereré-Monte Alegre district, we have found no evidence bearing on the geological age of the strata forming the hills. Fortunately the rocks of the plain afford some light. The last are not drift, as has been claimed, but, as is shown by the abundant and excellently preserved fossils, Lower Devonian.

In 1870, after exploring the Lower Tapajos, I determined to spend a month in the neighborhood of Ereré; but being obliged, first, to go to Pará, I left Messrs. Comstock, Smith and Staunton at Monte Alegre, to await my return. These gentlemen made an excursion to Ereré, and, in the shales described by Prof. Agassiz, they found an abundance of a beautiful little *Discina*. The first day after our arrival at Ereré, I ascended the mountain, sending Mr. Smith out on the plain to reconnoiter, and on my return I found he had brought in several species of *Spirifera*, *Streptorhynchus* and other fossils. The lowest beds of the series composing the plain are composed of a well bedded, extremely hard, almost black, cherty rock, sometimes breaking with a conchoidal fracture; though it is often shaly, especially when decomposed. It has afforded, as yet, no fossils. Above this is a series of shales, white, black, green, or mottled in color, and more or less well stratified. In the lower part of this series, there are thin, alternating layers of white and black or ash-colored shales, affording the *Discina* above mentioned, a *Lingula* or two, and fragments of plants. In the upper part, these shales contain *Vitulina*, *Spirifer* and other fossils, which are found in great abundance in a coarse white or reddish (when decomposed) sandstone which overlies the shales, but is nowhere well exposed, usually occurring as a surface rock, much cracked up, and in loose, angular fragments. Besides *Streptorhynchus*, *Spirifer* and *Vitulina*, this sandstone contains a *Lingula*, a few Gaster-

opods, *Tentaculites* and a beautiful *Dalmanites*, the latter with the margin of the pygidium, furnished with long, backward-projecting points. These fossils have a strong Lower Devonian facies. Prof. James Hall, to whom I submitted a small collection for examination, is of the opinion that these fossils indicate a horizon near the Upper-Helderberg of New York.\*

The whole thickness of these rocks visible is not more than seventy-five to one hundred feet. The plain is a little higher on the northern than on the southern side.

Though these strata are broken through by a perfect network of dykes, which here and there stand above the surface of the plain like ruined walls, they lie quite undisturbed. They appear to have been deposited in a basin, limited by the Serra of Ereré and the zone of hills on the west and north. The highlands of Monte Alegre are formed of clays and sands that overlie the Devonian strata.

As the strata composing Ereré and Tajuri are inclined, while the Devonian rocks of the plain lie quite horizontal, appearing to abut against the bases of both mountains, it would seem natural to conclude that the strata of these hills are older than those of the plain. If they are newer, the Devonian strata must suddenly dip under both moun-

\* In the summer of 1871, I revisited Ereré in company with Mr. O. A. Derby, my faithful and able assistant, and Mr. Steere. Mr. Derby and I made a very large collection of the above fossils, embracing many species not obtained by Mr. Smith and myself in '70. This collection has been arranged by my friend and student, Mr. Richard Rathbun, curator of geology in the Buffalo Academy of Science; and with his aid I am preparing descriptions and figures of the species. The Ereré fauna comprises about twenty-five species of *Brachiopoda*, of the following genera: *Spirifera*, *Vitulina*, *Tropidoleptus*, *Rhynchonella* (*Stenocisma* Hall) *Rhynchospira*, *Cryptonella* (?), *Streptorhynchus*, *Chonetes*, *Orthis* (?), *Lingula*, *Discina*, etc. Of *Lamelliibranchs* there are about twelve species belonging to the genera *Nuculites*, *Palaoneilo*, *Cypriocardinia* (?). Besides the above are several species of *Gasteropoda*, representing the genera *Pleurotomaria*, *Bellerophon*, *Platyceras*, *Tentaculites*, together with several Trilobites, one of which is a *Dalmanites*. In all, the number of species amounts to about fifty.

tains, and of this I see no evidence. At all events, neither Tajuri nor Ereré belong to the system of the Table-topped hills, and neither has the slightest claim to be considered to be of glacial origin.

The Ereré Devonian plain is partially wooded, principally along the water-courses or igarapés. The forest is far from luxuriant, and has a dense undergrowth of curuá palms (*Attalea*). The soil of the campos varies very much. Where alluvial, it is, for the most part, wooded; but usually it is very thin, and often so extremely stony that the surface appears macadamized and is quite sterile. The soil is for the greater part covered with a layer of small iron-stone nodules of about the size of beans, and with a glazed exterior. On the dry campos, which are usually covered with grass and scattered trees, immense candelabra-like cactuses (*cereus*) are not uncommon, and forcibly recall the campos region of southern Brazil. The forest in the perennially wet and alluvial grounds, or along the base of the mountain, is sometimes very dense and luxuriant, and abounds in murumurú (*Astrocaryum Murumurú* Mart), urucurí (*Attalea excelsa* Mart), mucajá (*Acrocomia*), and other palms. There are in the vicinity of Ereré some magnificent groves of urucurís. Prof. Agassiz has already referred to the forests of mirití palms (*Mauritia flexuosa*) which occupy marshes overflowed during a part of the year.

The vegetation of the Serras resembles that of the sandy campos, the trees being scattered and small. The cajú or cashew (*Anacardium occidentale*) and the yatá and sacurí palms are very common on the mountains. There is an immense patch of cactuses on the southern side of Maxirá.

The soil on the high, swelling ridges near Monte Alegre is a coarse and loose sand, and supports a campos vegetation. The trees are scattered, low, gnarly-branched and coarse-barked. As on the Serras, the cajú is very abundant, but it does not grow on the Devonian plain.

From the fruit of this tree a delicious wine is manufactured, especially at Santarem. The campo is covered with grass, that grows in wiry, scattered tufts. This is yearly burned over, the campos fires contributing largely, as in central Brazil, to give the peculiar character to the vegetation.

To the southward of the Ereré hills and Monte Alegre we have the great, open, grassy, alluvial plains of the Amazonas, diversified by irregular lakes and immense groves of the miriti, and traversed by *igarapés* and *paraná-merins*, bordered by strips of forest.

Dr. Silva Coutinho appears to have been the first to have collected the Carboniferous fossils of the vicinity of Itaitúba, on the Lower Tapajos; but he did not identify them as such, nor did he make any systematic examination of the locality. Moreover, I do not know that he has ever published any notice of his discovery. Prof. Agassiz simply says: \* “Maj. Coutinho has found Palæozoic deposits, with characteristic brachiopods, in the valley of the Rio Tapajos, at the first cascade; and Carboniferous deposits have been noticed along the Guaporé and the Rio Mamoré.” The only other notice of Dr. Coutinho’s work is made by Mr. Chandless, who says: † “It may be well to add that Dr. Coutinho found (as Prof. Agassiz told me) Silurian fossils at one of the lower rapids of the Tapajos, in about latitude 4° 32’ south.” The fossils found by Dr. Coutinho are Lower Carboniferous, and the locality was not at the first cascade, but in the vicinity of Itaitúba.

In the summer of 1870 I made a detailed examination of the Carboniferous rocks of the Tapajos, from the rapids to Itaitúba, and, with the help of my young assistants, made a handsome collection of fossils, especially from Itaitúba and the Igarapé do Bom Jardim. In 1871 I spent

\* A Journey in Brazil, p. 408.

† Notes on the Rivers Maué-assú, Abacaxis, and Canumá (Amazon), Jour. Roy. Geogr. Soc. (London, 1870), p. 4

a month at Itaituba, during which, with the aid of Mr. Orville A. Derby, I made a more careful study of these rocks, and collected several thousand specimens of the fossils, including many species not found in my previous collection. Illness preventing my going in person, Mr. Derby examined the Carboniferous strata between Itaituba and Aveiros. The Carboniferous rocks begin just below the entrance to the lowest rapids. Here the beds consist of sandstones, which are horizontal and without fossils. At Tapéra Alagada I found chert nodules with a few *Producti*, etc. At Barreirinha, on the left bank and several miles farther down the river, there are exposed in a bluff, shales mostly soft and of a blue color, with imbedded septaria composed of a very curious mottled rock, and containing *Ichthyodorulites* and other fossils, among which may be mentioned an *Orthoceras*. In the shales I found a single specimen of a *Lepidodendron* or *Hemingites*. Shales with septaria appear, below Barreirinha, in a long line of bluffs on the right bank, and, also, on the opposite side of the river, below the Igarapé do Uatapucurá, where I found them full of spore cases of *Lepidodendron* or *Hemingites*.

Just above Itaituba compact limestones appear in low bluffs on the left bank, at the Paredao. This limestone is full of fossils; but a better locality for collecting them is on the Igarapé do Bom Jardim, a little farther down on the same side of the river. On the banks of this little stream the limestone frequently forms shelf-like masses, beneath which are grottos. The shells, corals, etc., in the limestone, are, for the most part, silicified; and the water of the Igarapé, at flood time, has eaten away the lime rock, washing out the fossils, either leaving them projecting from the sides and roof of the grottos, or attached by a mere thread of stone, and ready to fall into the hand. These fossils are particularly valuable because they are not only well preserved, but they show the interiors.

The number of species is very large. Among them

may be mentioned a *Productus* resembling *P. Cora*, and another resembling *P. semireticulatus*; a beautiful little *Strophalosia* preserving its spines; together with species of *Rhynchonella*, *Orthis*, *Spirifer*, *Athyris* and other brachiopods; a large number of lamellibranchs, gasteropods, polyzoans, and a few crinoids and polyps. Some of the beds of limestone are full of thick, tortuous, root-like casts. Flint-like nodules also occur in the limestone.

At Itaitúba a series of rocks, very badly exposed on the beach that borders the village, affords an abundance of similar fossils, and some boulder-like masses of sandstone are full of large lamellibranch shells, together with a few cephalopods, gasteropods and a pretty trilobite (*Phillipsia*).\*

The limestones occur at several localities a few miles below Itaitúba; and they have at one of these localities, as well as at Bom Jardim, been used to make lime. They also occur on the Rio Cupari.

Below Aveiros the Carboniferous strata disappear below the level of the river, and they doubtless underlie a very large part of the basin. I am strengthened in this conclusion by the fact that Mr. Derby obtained from Senhor Gabriel of Obydos, specimens of the flinty rock like that of Itaitúba, and containing characteristic Carboniferous fossils, which the latter gentleman collected on the Rio Trombetas, on the northern side of the valley.

Mr. Chandless, in the paper above referred to, describes finding fossil shells, among which were *Spirifer* and *Productus*, in a limestone grotto on the Rio Paranary, a tributary of the Maué-assú lying west of Itaitúba. His

\* With the aid of Mr. Derby I am preparing descriptions and figures of these fossils, which will be published as soon as possible. Twenty-eight species of brachiopods have been made out. These belong to the genera *Streptorhynchus*, *Spirifer*, *Athyris*, *Productus*, *Strophalosia*, *Chonetes*, *Spiriferina*, *Rhynchonella*, *Orthis*, etc.; and the species are remarkable for their close resemblance to European forms.



description of "what look like fossil roots *in situ*," leaves no doubt that these rocks are the continuation of the Itaituba series. They also occur, according to the same observer, on the Rio Amána, another affluent of the Maué-assú, lying between the Paranary and the Tapajos. Prof. Agassiz, as above quoted, states that Carboniferous rocks exist on the Guaporé and Mamoré tributaries of the Madeira. All these facts go to show that the Carboniferous has a wide extension in the Amazonian basin.

2 { No Mesozoic deposits are known to exist in the Amazonian valley east of the Aquiry, an affluent of the Purús, on which Mr. Chandless has discovered Cretaceous beds with fossils. These are, so far as I know, the only Cretaceous beds known to exist on the Amazonas. The statement that "around the rim of the basin are the outcroppings of a Cretaceous deposit," is not warranted by facts. The Amazonas has a better claim to be considered a Carboniferous than a Cretaceous basin. It must be borne in mind that it was not until after the Cretaceous that the Andes-Rocky Mountain chain reached its present elevation, and that the plateaux of Guayana and Brazil were joined to the mainland.

111 { The flat-topped hills so often described by travelers on the Amazonas, and known collectively as the Serras do Parú, consist of several irregular patches and isolated hills, often widely separated, which are situated on the left or northern bank of the river, extending some fifty to sixty miles to the westward of Almeyrim, a little village now quite deserted, and distant about two hundred miles from the mouth of the main river. Von Martius ascended one of the hills in the vicinity of Almeyrim and reported it to be eight hundred feet high. He made no study of the geology of the hills.

Very different conclusions have been come to as to their geological structure, and Prof. Orton tells us that they are composed of "a coarse, porous sandstone, so

ferruginous as to resemble bog-iron ore.”\* But the cliffs, distinctly visible from the river, are chalk white!!

On my journey, in 1870, I had chosen the Serra of Ereré for study, supposing, after Prof. Agassiz, that it was a representative of this class of hills. I had no time left, after visiting Ereré, to examine the Serras do Parú, and I could only depend on certain topographical features, which quite satisfied me that, unlike Ereré, these last Serras were composed of soft material, horizontally stratified, and probably the continuation of the beds forming the Santarem bluffs. That there might, however, be no doubt left, I visited, in the summer of 1871, the Serra of Parauáquara, selecting it because it offered precipices where the geological structure would be displayed.

Starting from a cattle fazenda on the Rio Marapí, an affluent of the Javary, I made the journey to the Serra on foot, spending three days on the trip. Though the Serra appears very near when seen from the river, it is, in reality, very distant, certainly more than ten miles. By the direction we took, it is not less than twenty miles from the fazenda above mentioned; though, in a straight line, it may be nearer. Strange to say, the Serra and its vicinity were to every one a *terra incognita*, and the people were so superstitious that they were afraid to visit it!

Going eastward, the greater part of the country we traversed was uneven, and, near the Serra, very hilly, the surface being covered with blocks of ferruginous sandstone. It was an alternation, or, more properly speaking,

\* “The Andes and Amazon,” p. 281. The same author—who, by the way, “did” the whole valley of the Amazonas, with the Rio Napo thrown in, in less than six weeks, traveling day and night—tells us, on page 252, that the hills of Almeirim lie back of *Monte Alegre, behind a swamp*, and that they are composed of a *pebbly conglomerate*!! These slight inaccuracies are, perhaps, pardonable when we consider that the author, leaving Santarem at two o’clock in the morning, came up off Parauáquara late in the afternoon, and, passing the Almeirim hills in the dark, was early the next morning assisting in the taking in of wood in Porto do Moz!!!

a mixture of campo and wood, grassy patches with few trees, and thick but low, dry-looking woods. A heavy, luxuriant forest, however, is found along water-courses and in swampy places, with here and there a jungle of the magnificent, banana-like pacúa-sororóca (*Phanacosperrum*). The campos and mixed country were extremely difficult to traverse, owing to the height of the grass and bushes, and the abundance of sword-grass (*cariá*), that tore our clothes and wounded our legs and hands. Von Martius has called attention to the great resemblance borne by this vegetation to that of the *campos agrestes* of Piahy. The ascent of the Serra was made by a sharp spur on the south-eastern corner; but, owing to the abundance of sword-grass and the difficulty of climbing, it was very tiresome. Bates speaks of this Serra as being destitute of trees. It may appear so because of the distance from the river. It is, indeed, bare on the steeper slopes, but the top is covered by a low wood, so thick as to be extremely difficult to penetrate. The sides of Parauaquára are generally very steep, and, in some places, irregularly terraced, owing to the unequal wearing away of the strata. In some places they are precipitous, and at the south-west angle is an immense gulf like one side of the crater of a volcano, which is extremely grand. The serra is composed of a series of clays, more or less sandy, and of different colors, but usually whitish, together with very soft clayey sandstones, white, yellow, reddish or mottled. The prevailing color of the rocks of the series, however, is white. The distinction between the various strata is well marked out, not only in the cliffs, but, also, by parallel lines running along the sides of the mountain; but the different beds are not well laminated. It is hardly necessary to state that the strata composing the serra are horizontal, and that the top is as level as a floor. The uppermost bed is a red, clayey soil. Under this is a thick bed, full of nodules of iron-stone, the nodules being long, closely packed and perpen-

dicularly arranged. At the base of the mountain, springs of delicious water spring out as from the bluffs of Santarem.

Away to the north of Parauáquara are seen other hills of the same kind. Judging from the outlines of these Serras, seen from Tajurí, some appear to be perched on a base of a different formation. Moreover, these northern Serras appear higher than those near the river.

No one can doubt that the Serras of Parú are the remains of a formation that was once continuous over this part of the valley ; but I see no reason for supposing that it was continuous to the same height over the the whole valley.

On the opposite side of the Amazonas, and a few miles back from the main river, a line of bluffs four hundred feet high, more or less, extends westward toward the Xingú, and southward along the Tapajos river to the rapids. These bluffs are almost invariably very steep and wooded, so that they afford but few sections. Near Santarem, at Panéma, Irurá and Diamantina, and still better at Alter do Chao, where there are several outlying hills, their structure may be well studied. Here we find the same kind of deposits that occur in Parauáquara, and, notwithstanding the difference in height, I am disposed to consider the strata composing the table-lands back of Santarem, and bordering the Tapajos, as the continuation of the Parauáquara series. The Serras on the north side of the river stand at a higher level, probably because of the greater height of the bottom on which they were deposited, the Santarem beds having been accumulated nearer the center of the basin, where the water was deeper. It may, however, be that the slope is owing to the beds having been elevated more in the north than in the south. If this be the case, the question suggests itself whether the serras of Parú are not outliers of the great Tertiary sheet of the interior of Guayana, where it forms mountains such as Waetipu and Roraima—the

former about five thousand, the latter seven thousand feet high, and with mural precipices two to three thousand feet in height\*—and whether both may not be of the same age as the great sandstone sheet that spreads over so great a tract in the interior of Brazil. Parauaquára resembles the chapadas of the basin of the Jequitinhonha, and Von Martius has compared the serras of Parú with the table-topped hills of Piauhy. Neither in Guayana, on the Amazonas, in Piauhy nor in central Brazil, have these beds afforded fossils. In my "Geology and Physical Geography of Brazil," I have claimed that they are most probably Tertiary in age. I see no reason for changing my opinion. I see not the slightest reason for believing that the deposits forming the Serras of Parú are of glacial origin, while it is utterly\* incomprehensible to me how they could have been formed in fresh water, when we have not the first fact to show that any barrier ever existed across the mouth of the Amazonas behind which water could accumulate.

Before the rise of the Andes the Valley of the Amazonas consisted simply of two gulfs, united by a narrow strait. The Andes were thrown up across the mouth of the western gulf, converting it into a basin, though it probably had an outlet both to the north and south. The whole continent was afterward depressed, so that the waters covered widely the Guayanian and Brazilian plateaux, and the Tertiary beds were deposited there, varying in thickness, coarseness or fineness, according to the conditions under which they were formed.

We should expect that these beds should conform in level with the bottom on which they were laid down, lying higher on the shallower borders of the basin, and dipping in every direction toward its center. When the continent was once more brought above water, the plateaux, leveled by their new acquisition of strata, first rose ;

\* Sawkins, Geological Observations on British Guiana. Quart. Jour. Geol. Soc., London, vol. xxvii, No. 108, p. 432.

but by-and-by the present water-sheds, joining the great plateaux with the Andes, came above water, and the Amazonian Valley became a Mediterranean, communicating eastward with the Atlantic by a narrow strait. The soft Tertiary beds of the province of Pará were rapidly denuded by the action of the sea during the rise of the land. Probably while Guayana existed as an island, the Amazonas felt the influence of the equatorial current, which may have aided in the carrying away of the results of denudation. In the end, the Tertiary beds were completely swept away over an immense tract of country; the Serras of Pará, and the similar mountains to the northward, were left as monuments of its existence. At Monte Alegre, Santarem, and near Alter do Chao, the wide, sandy, rounded ridges appear to be remnants of the Tertiary hills which have been worked over, and in part restratified, until they appear like huge sandbanks. While the Tertiary sheet was being denuded away, the streams from the highlands were cutting for themselves valleys through the same beds, and these, forming estuaries, were widened to a greater extent than it would have been possible for the streams themselves to have done. During this epoch of denudation, deposits were being laid down, not only in the bottom of the interior sea, but also in the gulf, into which it opened to the east. It was in the latter part of this stage of growth of the basin that the clays of the upper Amazonas were deposited, and the Pebas shells lived. This appears to have been near the close of the Tertiary. A heavy bed of lignite underlying the clays near Tabatinga, was discovered quite recently by Dr. Pimentel, of the Commission of Limits, a gentleman to whom I am under many and deep obligations.\*

As the rise continued, the interior sea, now shallowed

\* Since the above was written, I have published a little paper "On the Tertiary Basin of the Marañon," in the *Am. Jour. Science and Arts*, Vol. IV, July, 1872, in which are given the results of a recent examination of the Pebas beds by my friend, Mr. J. B. Steere.

by much sediment, and freshened by the tribute of a thousand streams, was rapidly narrowed in area, and the river Amazonas, properly speaking, which heretofore emptied into the lake at the foot of the Andes, began to extend its channel, following the retreating waters. At last, the strait that communicated with the interior basin was narrowed down between the line of hills extended from Obydos to Almeirim and the bluffs on the Santarem side, a distance of not less than thirty or forty miles. This was the narrowest point. I may add that the channel of the river is narrowed at present, at Obydos, by the growth of the alluvial flats on the southern side.

It has been claimed that the strata forming the Island of Marajó and the main land at Pará are continuous over the whole Amazonian Valley. I must confess that I have been totally unable to connect together the clays and sands of the Amazonas intermediate in age between the Almeirim beds and the modern alluvia.

Pará is built on a sort of ridge about thirty feet in height. The beds of which it is composed are excellently exposed in numerous pits and excavations, and are as follows :

I. A variable thickness of dark, loamy soil.

II. A bed of a loose, yellowish-brown mixture of clay and sand full of coarse grains, passing downward into a light colored material of the same general character, containing an abundance of nodules of all sizes and shapes, and consisting of the above material cemented by iron oxide. In this bed there is occasionally a streak of white or red clay. The thickness of this bed varies very much ; in some places being ten or more feet. Elsewhere this bed appears to pass into a mottled clay.

III. An unknown thickness of sand, very pure, coarse and unmixed with clay, usually white, but sometimes red in color.

Bed No. II has been compared with the drift clays of the vicinity of Rio. To me it appears very different. If,

now, we examine the southern side of the island of Marajó at Soure, we shall find a bed similar to No. I of the Pará section, and which, like it, contains nodules formed by the irregular consolidation of the lower part of the bed by iron oxide, the nodules coalescing so as frequently to form masses traversed by irregular perpendicular channels. This mode of solidification of loose materials by iron oxide is very common in Brazil, and is found to take place in the lower part of the coast clays of Espiritu Santo and Bahia. I have observed it also in the Carboniferous rocks of the Tapajos. I have already called attention to it in the clayey stratum below the superficial soil of the Serra of Parauaquára. These nodules may occur in any formation. Underneath the bed at Soure, first described, instead of sand we find tabatinga clay. At the Barreiras, just above Cametá, on the Tocantins, the clays are mottled. I have never succeeded in finding the lower stratum of sand of the Pará section in any other part of the province, and I have seen the river at its lowest stage. I cannot help coming to the conclusion that the deposits under discussion are, more or less, local, and not necessarily of the same age. They are certainly newer than the Almeirim beds. In great part these so-called Amazonian clays are certainly recent.\* Not having studied the similar deposits of the Upper Amazonas, I am unable to compare them with those of the lower river.

Whatever may be the age and relationship of the beds of Pará and Marajó, there can be no doubt that the island of Marajó came above water just as the Amazonas was passing out of the estuary condition. The lands bordering the channels by which the Amazonas now communicates with the Pará river, are very recent; and there can be no doubt that, when the island of Marajó rose from the sea, the Amazonas communicated with the Pará by a wide channel.

\* See my paper cited in note on p. 247.



It has been said that there are no terraces in the Amazonian Valley. Just south of the Serra do Maxirá there is a terrace some twenty feet high above the general level of the country, and, as near as I could estimate, forty feet above the level of the Amazonas at the end of the dry season. This terrace is composed of stratified sands and clays, formed when the strait was bounded by the Santarem and Ereré highlands. The Amazon then formed a tidal estuary that opened to the east into a broad gulf. The Tocantins, the Xingú, the Tapajos, the Mané-assú, the Abacaxis and Canumá, and, very probably, still other rivers to the westward, below their rapids, where they left the Palæozoic basis of the plateau, formed broad estuaries also, with wide mouths. At last, however, the shallowing of the waters of the Amazonas necessitated well defined channels. Islands grew, were fused together and were joined to the mainland, or they narrowed down channels until they formed *paraná mirins*.<sup>\*</sup> These side-channels are extremely numerous, and often there are several lying one behind another, and intercommunicating. Though in most cases, I believe, they are due to the growth of islands, rivers frequently flow into them and aid in keeping their channels open.

The growth of the alluvial bottom lands, and of islands, has caused them to encroach on and narrow the mouths of the secondary estuaries, as, for instance, the Xingú and

<sup>\*</sup>This very expressive Tupí word is derived from *Paraná* (sea or great river), and *mirín* or *mirí* (little). It is applied to the river-like and often long side channels that, leaving the main river, flow through the alluvial flood-plain to rejoin it again below. I may take this opportunity to state that the Tupí-speaking Indians call the Amazonas *Paraná*, or, in Portuguese, the sea. This is the answer an Indian will give when asked the name of the Amazonas. The similarity between Marañon, or Maranhao, and Paraná, or paranán (nasal) is very striking; and I am inclined to think that they are the same word. In the Lingoa Geral, or modern Tupí, there are examples of an interchange of M and P; and the Indians who first gave the name to Orellana may have pronounced it with an M, or at least an obscure sound readily mistaken therefor.

Tapajos, or of the Maué-assú. These are clear-water streams, but their current is so slight that, as in the Xingú and Tapajos, the muddy waters of the Amazonas flow in during the dry season and ascend several miles : beside, in flood-time, all the low lands are overflowed and the current of the Amazonas presses the waters of these rivers up against their eastern banks. There is, therefore, a tendency for the Amazonas to build either a point, usually cut through by a *furo* or *paraná-merim*, eastward from the eastern branch of the river, at its mouth, or to form a series of islands. Witness the enormous irregular alluvial deposit that chokes up the mouth of Tapajos Valley on its western side ; also, the same feature, with the addition of islands, in the mouth of the Xingú, and how completely the great so-called island of Tupinambaranas has cut off the Maué-assú, Abacaxis and Canumá from the main river, compelling them to empty into a *paraná-merim*.\* The lower Xingú is still an estuary, and for some distance above its mouth is swept by strong tidal currents, which, while preventing the closing of its mouth, have helped build up an immense tract of alluvial land on each side. The so-called river Pará is more properly, to-day, an estuary, freshened by innumerable streams, and by a large contribution from the Amazonas. At Pará the tide runs up with fearful velocity. The amount of water furnished by the side rivers, above named, is very small compared with the immense width of these rivers below their rapids. The mouth of the Tapajos is a little over a mile in width ; but inside the river widens rapidly, and soon forms an expanse more than ten miles wide opposite Villa Franca, with a broad water horizon, looking up stream. The same is the case with the Xingú, and on a smaller scale with the three rivers lying between the Tapajos and Madeira. The waters of all these rivers, and

\* See Mr. Chandless' excellent paper and maps of these rivers, already cited, also Penna. Regias Occidental da Provincia do Pará.

here we may also include the Tocautins, are dammed back and spread over the broad valleys, which their clear waters have not yet been able to silt up. The wide lower reaches of these rivers are, then, true lakes, the barrier that prevents their passing into the true riverine condition being the waters of the Amazonas.

The flood plain of the Amazonas is diversified by innumerable lakes, some of which, as that of Villa Franca, for instance, are of many miles in length.

In conclusion, I may state that, in the eastern part of the Valley of the Amazonas, I have seen no traces of glacial action, though I have looked carefully for them. While I still adhere to the belief that glaciers once existed on the Brazilian plateau, I see no evidence of their having existed on the Amazonas.

NOTE.—This paper was read just before I made my expedition to the Amazonas in 1871. On my return, I made several important additions and corrections. Owing to my having mislaid a note-book I was unable to give the following heights in the body of the paper and so I append them here:

Serra de Ereré, by barometrical measurement made by myself, 970 feet. There appears to be a point a little higher than the one I selected as the highest, so that the Serra is about 1,000 feet in altitude.

The Serra de Parauaquára I found to be 1,200 feet high, and the Bluff at Taperinha near Santarem 450 feet.

## VIII.

OBSERVATIONS ON THE GEOGRAPHY AND  
ARCHÆOLOGY OF PERU.

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BY E. G. SQUIER, M. A., F. S. A.

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READ FEBRUARY 15TH, 1870.

In the year 1863 I was sent to Peru, by the government of the United States, to settle long-standing claims between the two republics, which had several times interrupted their friendly relations. After accomplishing that object, I commenced a series of explorations and investigations in the country, for which my official position gave me some important facilities. These occupied me for two years, and were mainly directed to an illustration of the aboriginal monuments, and an exposition of the archæology of the country. They carried me from Païta, on the north, to Arica, on the south, including a survey of the remarkable remains of Grand Chimú, and the ancient monuments in the valleys of Viru Santa, Nepena, Casma, Supe, Chillon, Rimac, Lurin, Canete, the two Chinchas, Pisco, Arica, etc., etc. From the latter port I crossed the Cordillera to Bolivia, into the great terrestrial basin of Lake Titicaca, visited the enigmatical ruins of Tiahuanaco, the Sacred Islands of Lake Titicaca, and the monuments on its shores, and thence followed the footsteps of the traditional Manco Capac to the imperial city of Cuzco, the capital of the Inca empire, and the Rome of the new world.

From this interesting centre, I made expeditions in every direction, over a radius of a hundred miles, visiting and carefully investigating the vast remains of Ollantaytambo, Pisac, Paucartambo, Muyna, Limatambo, etc., etc.,

and finally directed my steps northward, through Abancay, Andahuylillas, Ayacucho (the ancient Gumanga), nearly to Jauja, when the heavy rains compelled me to descend to the coast at Lima.

It would be impossible for me, in the compass of a single paper, even if it were appropriate before a society of geography, to give a detailed account of the results of my investigations in the rich and wide field of Peruvian archæology. I may, nevertheless, say, I hope, without improper assumption, that these investigations were conducted according to the requirements of modern science, through the aid of the compass, the line, the pencil, and the photographic camera, and will, I think, contribute to remove the subject, to which they principally relate, from the mists of speculation, and put its study on a sure foundation.

Geography, as I have intimated, was a secondary object, or rather an incident, in my explorations, and did not receive very close attention, except where it bore, or was supposed by me to bear, on archæological questions. I should have been delighted to have contributed my efforts to a solution of the geographical problems, of which Peru and Bolivia afford so many examples; to have visited the unexplored lake of the Aullagas, whose conjectural outlines continue to disfigure our maps, to the standing disgrace of the geography of the age; and I should have been still more gratified if, leaving behind me the auriferous frontier province of Carabaya, I could have penetrated into the vast, unknown region through which the Madre de Dios flows, and where popular fancy places the second Inca Empire of Paytiti. But I had neither time nor means to give to these objects, which I hope soon to see taken up with the zeal and devotion that are so rapidly exposing to us the secrets of Africa.

Nevertheless, some of my geographical observations, if not very striking in character, may have importance in correcting existing maps, and increasing the sum of our

information concerning a country little known and very imperfectly delineated. I need not say that no portion of the globe has bolder or more marked geographical and topographical features than Peru. In no part of the world does Nature assume grander, more imposing, or more varied forms. Along the Pacific coast is a belt of desert, intersected here and there by narrow valleys of wonderful fertility, or relieved, near the mountains, by *oases* not less fertile. Succeeding this belt, inland, is the declivity of the Cordillera, notched by gorges, through which flow streams of varying size, fed by melting snows or the rains that fall, for part of the year, in the interior. On the coast, except as a remarkable meteorological phenomenon, rain never falls—a fact bearing in a marked manner on the aboriginal architecture of that region. Ascending the escarpment of mountains, we find a grand elevated ridge or mountain billow, bristling with snowy and volcanic peaks, and often spreading out in broken, cold, and arid plains or *Punas*, with little of life to relieve their forbidding monotony. This broad and frozen belt, called *El Despoblado*, varying from 14,000 to 18,000 feet in height, is succeeded, in the south of Peru and Bolivia, by the great terrestrial basin of Lakes Titicaca and Aullagas, which is completely shut in by the Andes and the Cordillera. Above, or to the northward of this, the two ranges separate again, forming the vast Andean Plateau, the Thibet of America, deeply grooved by streams which all find their way eastward into the Amazon.

The American continent affords three conspicuous examples of that interesting physical phenomenon, the Terrestrial Basin, with its own fluvial system and its own water reservoirs. First, the great Utah basin, with its Salt Lake; second, the smaller basin of Lake Itza, in Central America; and third, the vaster, more elevated, and in all respects more interesting basin of Lake Titicaca. The limits of this basin, on the south, are not yet

accurately determined, but, calculating from the Pass of La Raya, on the north, in latitude  $14^{\circ} 50'$ , and longitude  $70^{\circ} 50'$  west of Greenwich, it may safely be estimated to have a length of between 500 and 600 miles. Its width, calculated by the reach of the streams which concentrate in it, varies from 100 to 200 miles, and may be taken to average not far from 150 miles, thus giving a total area of about 100,000 square miles. Its eastern border is bounded by the loftiest section of the Andes—a vast, unbroken, snow-crowned range, whose lowest peaks rival Chimborazo in altitude, with the gigantic mass of Illampu or Sorata at one extremity, and the scarcely less imposing bulk of Illamini at the other.

The slope of the Titicaca basin is gentle towards the south. In its northern and highest portion reposes Lake Titicaca, a magnificent body of fresh water, comparable only with the North American lakes in respect of size, and lying at the extraordinary elevation of nearly 13,000 feet above the sea. It receives several considerable tributaries, some of which are scarcely fordable even in the dry season, and discharges its waters through a broad, deep, and swift, but not turbulent stream, El Desaguadero, into Lake Aullagas. This stream is about 170 miles long, and has a fall of not far from 500 feet in its course, a fact which sufficiently disproves the old story, that the two lakes are so nearly on the same level that sometimes the waters flow from the one into the other, and *vice versa*. Of Lake Aullagas, as I have intimated, we know next to nothing. The most that seems to be established is that it has no visible outlet to the sea. That it receives the drainage of Lake Titicaca; that its principal feeder, the Desaguadero, is swollen by some considerable streams, after leaving Lake Titicaca, and that it has itself a number of important feeders, we know. Its size, contour, depth, and the possible disposition of its affluence of waters are open questions. It must be of vast superficies indeed, if its excess of water be carried

off, as has been suggested, by evaporation. Altogether, I regard Lake Aullagas as offering the most interesting geographical problem for the solution of the explorer on the whole American continent.

Lake Titicaca, from its size, altitude and relation to the extraordinary terrestrial basin to which it gives a name, and in which it is so conspicuous a feature, is, perhaps, the most remarkable body of water in the world. It is a long, irregular oval in shape, with one-fifth of its area nearly cut off by the opposing peninsulas of Copacabana and Tiquina. Its greatest length is not far from 120 miles, and its greatest width between forty and fifty miles. Its mean level is 12,864 feet above the sea, but varies a little with the seasons. Its outline, as well as its general features, and the most conspicuous points on its shores, were very accurately fixed by J. B. Pentland, formerly British Consul-General in Bolivia, who visited it in 1827-28, and again in 1837.

His observations are embodied in a chart published by the British Admiralty, entitled "Map of Lake Titicaca, with the Valleys of Yucay, Collao and Desaguadero," which I have elsewhere substantially reproduced, with some corrections of my own. I spent three weeks on this lake in an open boat, in company with Prof. Raimondi, a gentleman of high scientific attainments, and can bear testimony to the general accuracy of Mr. Pentland's observations. Further on I shall take the liberty of correcting some of his more considerable errors, merely remarking here that, considering the difficulties which the traveler has to encounter among the high Andes, it is only surprising that his mistakes are so few.

The eastern or Bolivian shore of Lake Titicaca is abrupt, the mountains often pressing down boldly into the water. The western and southern shores, however, are relatively low and level, and the water here, especially in the bays and estuaries, is shallow and grown up with reeds and rushes, among which myriads of water-fowls find shelter



and support. A large part of these low grounds are still marshy, and the roads are carried across them on stone causeways of Inca origin. A fall of ten feet, in the mean level of the lake, would, perhaps, lessen its area by one-fifth. It would lay bare most of the large bay of Puno, and a very large part of the bays of Tiquina and Guaqui. It is easy to see that the lake once covered a much larger area than it now occupies. It must not be supposed, however, that it is generally shallow; on the contrary, it is, in many places, very deep, soundings being beyond the reach of a line of 100 fathoms.

I have said that the level of the lake varies with the seasons. In the dry or winter season it is from three to five feet lower than during the summer or wet season. This rise and fall of the water certainly contributes to the support of the herds of cattle that, during the period of rains, find food in the vast pastures of Puno, the ancient Collao. As already observed, in the shallow parts of the lake grow wide belts of reeds, and a kind of tender lake-weed, called, in the Quichua language, *Uacta*, on which cattle eagerly feed. This weed grows luxuriantly, reaching the surface from depths of from ten to twelve feet. When the dry and cold season comes on, and the grass of the pasture becomes sere and dead, the cattle flock to the lake to subsist on this plant or weed. Soon that portion of it nearest the shore is consumed, and then commences a process which, if we accept certain theories regarding the law of adaptation, may, sooner or later, convert the cattle of the Puno into hippopotami! They press into the water until their backs are barely visible, and the line between the water they have cleared and the mat of weeds beyond indicates the line of four or more feet soundings as clearly as if it were laid down in a chart. As the water of the lake subsides, the line is pushed further on, until the recurrence of the rains revives the pastures and the waters of the lake rise to their former level. Were it not for this resource, the

department of Puno could not well support, through the winter, the herds of cattle that now constitute a principal part of its wealth.

The lake never freezes over, but ice forms near its shores and where the water is shallow. In fact, the lake has an important influence on the climate of this high, cold and desolate region. Its waters, at least during the winter months, are from ten to fifteen degrees of Fahrenheit warmer than the atmosphere. Its islands and peninsulas feel this genial influence most perceptibly; and I found barley, peas and maize—the latter, however, small and not prolific—ripening on them, while they did not mature on what may be called the mainland.

The prevailing winds on the lake are from the northeast, whence they often blow with great force, and the waves roll in on its western and southern shores with something of the force and majesty of those of the ocean. Severe storms are not unfrequent, rendering navigation on the frail *balsas* or rafts of *totor*a or reeds, always slow and precarious, exceedingly dangerous. Great but misdirected efforts have been made to place steamers on the lake, and portions of two small ones of iron have been for seven years in the town of Puno. A great drawback to their success will be the want of fuel, of which there is very little, in the shape of stunted *quenua* or wild olive-trees, growing on the more sheltered parts of the island. I was, however, shown some specimens of very good bituminous coal, said to have been found on the peninsula of Copacabana, but was unable to visit the alleged deposit.

Lake Titicaca has several considerable bays, of which those of Puno, Huancané and Achacache are the principal, and it has also eight considerable islands which are habitable or inhabited, viz., Amantené, Taqueli, Soto, Titicaca, Coati, Campanario, Taquari and Aputo. Of these the largest is Titicaca, high and bare, ragged in

outline as rugged in surface, six miles long by between three and four miles in width.

This was the sacred island *par excellence* of Peru. To it the Incas traced their origin, and to this day it is held by their descendants in profound veneration. According to tradition, Manco Capac and Mama Oella, his wife and sister, children of the Sun and commissioned by that luminary, started hence on their errand of beneficence to reduce under government, and instruct in religion and the arts, the savage tribes that occupied the country. Manco Capac bore a golden wand, and was directed to travel northward until he should reach the spot where the rod would sink into the ground, and there fix the seat of his empire. He traveled slowly along the western shore of the lake, through the broad and bleak Puna lands, up the valley of the Rio Pucura to the Lake of La Raya, where the basin of Titicaca ends, and whence the waters of the Rio Vilcanota start on their course to swell the Amazon. He descended the valley of that river, until he reached the spot where Cuzco now stands, where the golden rod disappeared. Here he fixed his seat, and here, in time, rose the City of the Sun, the capital of his empire, the shrine of religion, and the center of his power.

Upon this island, the traditional birthplace of the Incas, are still the remains of a temple of the Sun, a convent of priests, a royal palace, and other evidences of Inca civilization. It is easy to find the shallow cave, under a huge shelf of sandstone, where Manco Capac took shelter until he received his high commission, and which was venerated beyond any object in the Inca empire. In the warmest and most sheltered nook of the island is a garden of the Incas, with its baths and its fountains still flowing with silvery sheen and murmur. Not far from Titicaca is the island of Coati, sacred to the moon, on which stands the famous Palace of the Virgins of the Sun, built around two shrines dedicated to the sun and the moon,

respectively, and which is one of the best preserved and most remarkable remains of aboriginal architecture in America. The island of Soto was the Isle of Penitence, to which resort was had for fasting and humiliation. In common with all the other islands I have named, it has considerable remains of ancient architecture.

The population around Lake Titicaca is, of course, almost exclusively Indian. The Aymaras largely predominate, the Quichua language being confined to a part only of the inhabitants of the town of Puno, and those living between Puno and Huancané. There is a marked difference between the Aymaras and Quichuas physically, although their languages have many features in common. The former are a smaller, darker, more sullen and incommunicative race than the latter, who, in my opinion, constituted the dominating or Inca family in the empire of Manco Capac.

I have said that the map of Lake Titicaca and its environs, by Mr. Pentland, is, beyond comparison, the best extant. In fact, later travelers have been content to adopt it, with few, if any, additions or corrections. And I am sure that its industrious and conscientious author will be glad if I can, in any degree, contribute to the perfection of his elaborate and excellent work. In this belief I wish to point out some of his most conspicuous errors.

While the outlines of the lake, as given by Mr. Pentland, may be considered as approximately exact, it will be obvious, to the traveler on the spot, that the space between the island of Titicaca and the Bolivian shore is far too narrow, and that the Bay of Tiquina is much too small. My observations, made with a view of determining this point, have not yet been reduced, but I have no doubt they will substantiate what I now say.

The courses of some of the rivers falling into the lake, as represented in the map, are also quite inexact. The River Pucura, or Ramis, rising in the Lake of La Raya,

is well laid down. But the map errs in making the considerable river of Azangaro, which rises in the mountains toward Carabaya, fall direct into the lake, a little to the eastward of the mouth of the Ramis. This is quite another stream, the Putina, while the Rio Azangero is a tributary of the Ramis, and unites with it a few miles above the town of Taraco. Between the Putina and Ramis, but discharging into the latter, is the considerable Lake of Arapa, more than ten leagues in circuit, and also the salt lake, Laguna de Salinas, which, however, like many other of the Andean lakes, has no outlet. Neither of these lakes is indicated in Mr. Pentland's map, which is also wrong in making the Rio Lampa, which receives the streams that descend from the lakes of the Pass of La Compuerta, in the Cordillera, enter the Lake of Titicaca a little to the west of the mouth of the Ramis. So far from this being the case, the Lampa falls into the northern extremity of the Bay of Puno. The Lake of Umayo, which is represented as discharging into the Rio Lampa, has, in fact, no outlet. It is a singular lake, deeply sunk in the rocky plateau, but yet considerably elevated above the level of Lake Titicaca itself. It abounds in fishes, one variety of which, sent by me to Prof. Agassiz, is believed to be entirely new, and, possibly, peculiar to the lake in question. It is on a peninsula projecting boldly into this lake that we find the remarkable group of ancient burial towers, known as the *Chulpas* of Sillustani.

Before turning away from the rather ungrateful task of indicating or correcting errors, I may observe that the course of the nameless stream, flowing past the town of Santiago de Machaca, on the road from Tacna to La Paz, is not to the south-east, as represented by Mr. Pentland, but northeast, reaching the Desaguadero above Nasacara, and not falling into the Rio Maure. There are other mistakes in Mr. Pentland's map, and, consequently, in those of the travelers who have copied it, which I hope to correct

in my own map, of which, however, that of Mr. Pentland must form the basis as well as the most important part.

Mr. Pentland has correctly indicated the little lake of La Raya, occupying the very crest of the "divide," or Pass of La Raya, as being the common source of the Rio Pucura, flowing into Lake Titicaca, and the Rio Vilcanota, which, under its different names of Vilcamayo, Urubamba and Ucayali, constitutes unquestionably the Rio Madre, or mother stream, of the Amazon. This little lake is only a few hundred yards across, and springs up in a depression in the "divide," among masses of bog or turf, with snowy mountains on every side. A cork thrown into the center of the lake might find its way northward into the Amazon, or southward into Lake Titicaca, depending, probably, on the direction of the wind. I am happy to confirm Mr. Pentland's accuracy as regards this lake, and the more so since the question of lakes with two outlets has called out some discussion in connection with African travel. Mr. Pentland fixes the altitude of the Lake of La Raya at 13,380 feet above the sea. I think this altitude, like most of the others given by this authority, is below the fact. The altitudes, given by Mr. David Forbes, of some of the mountains of Peru and Bolivia are considerably greater than those given by Mr. Pentland, and conform better with those which I have myself determined. For full and authentic information on these points, however, as well as upon the geography, zoology, botany, geology and mineralogy of Peru, we must await the publication of Prof. Antonio Raimondi's researches in that country, where he has spent twenty years in the collection of data, with a zeal, intelligence and industry impossible to be surpassed.

While speaking of the source of the Amazon, I may perhaps be indulged in some observations on that great river, and the plans and attempts that have been recently made to utilize it by the people dwelling on its upper

waters, and for bringing the vast regions which it drains within the circle of colonization and modern development. The Amazon, or, as it is called on the spot, *El Amazonas*, is understood to be formed by the union of the great rivers Marañon and Ucayali, near the Peruvian establishment of Nauta. It has been a question which of these streams may be considered as the Rio Madre, or main river, and whether that name should be given to the longest stream, having its rise furthest from the point of junction, or to that which carries the greatest volume of water. As regards length, there is no doubt that the Ucayali exceeds the Marañon by several hundreds of miles, whether its longest branch be the Urbamba or Vilcamayo rising in the Lake of La Raya, or the Apurímac, rising in the province of Caylloma, department of Arequipa. As regards volume, we can only accept the evidence of those who have had opportunities of making a comparison. Our latest authority, on this as on some other interesting points, is Dr. Santiago Távora, a member of the Hydrographic Commission, sent out in 1868, by the Peruvian government. After reaching Nauta, at the junction of the Marañon and the Ucayali, he writes: "The Marañon is not the main stream of the Amazon. To deserve that distinction it should have greater length and a greater volume than the Ucayali; it has neither, and leaves the latter to bear, without dispute, the title of Rio Madre del Amazonas."

The Ucayali, besides the interest attaching to it as the Rio Madre del Amazonas, has lately been invested with special importance, through the active explorations of the Amazonian tributaries reaching into Peru, by the government of that republic, and by enterprising and adventurous individuals. It has long been the dream of Peru, but more especially since the introduction of steam, in some way to utilize the Amazonian waters, by establishing, through them, a direct communication between the populated highlands of the Peruvian interior and the

Atlantic coast and Europe. Obviously such a communication, if practicable, would be of great advantage to that region, and might lead to its ultimate development. After, however, what I have seen and learned of interior Peru and its real capacities, I must say I am not inclined to share in the high anticipations that have been indulged in, regarding its future, by writers, native and foreign. Up to within a very recent period it was believed that the interior might be reached by four great highways,—first, by the Purús, which flows into the Amazon in latitude  $3^{\circ} 50'$  south, longitude  $61^{\circ} 17'$  west, and was supposed to reach to the province of Corabaya, department of Puno, and take its rise in the snowy region of the Andes, bounding the basin of Titicaca on the north-east. It was supposed to flow thence, and, under the name of Madre de Dios, pass through the important province of Cuzco, less than 100 miles to the east of that city, and to constitute, from its head of navigation, wherever that might prove to be, the natural highway of Southern Peru, *viâ* the Amazon, to the Atlantic. The investigations of Don Faustino Maldonado, who lost his life in making them, and of Prof. Raimondi, have proved, however, that the streams of Carabaya, and the Madre de Dios itself are affluents of the Beni, which in turn is an affluent of the Madeira, or else themselves flow direct into the Madeira. In either case they must reach that river above its falls, which are not transitable for steamers.

The next great river, penetrating Peru from the Amazon is the Purús, which, as I have said, was supposed to reach close to Cuzco. This has been thoroughly explored by an adventurous Englishman, Mr. Wm. Chandless, who has ascertained that its navigable waters do not come near the Andes, nor approach anywhere within practicable communication with the settled parts of Peru. The same may be said of the comparatively small rivers intervening between the Purús and the Yavari, which latter,



for a considerable part of its length, forms the boundary between Peru and Brazil.

Our principal, indeed our only knowledge of the Yavari is derived from the reports of the mixed Peruvian and Brazilian Boundary Commission that undertook its ascent in the autumn of 1866. They reached a point, at an estimated distance of 1,000 miles from the mouth of the river, when they were driven back with loss, by the Indians. Captain Carrasco, the Peruvian Commissioner, reports it navigable for steamers of small draft to the mouth of an affluent that he calls Rio Galvez, a distance, calculated from his observations, of about 300 miles from the Amazon.

The Amazon now enters wholly into Peruvian territory, where it has been for some years traversed by Peruvian steamers in conjunction with a Brazilian line below. At Nauta, 500 miles from the frontier, it loses its distinctive name, and separates, as we have seen, into two large tributaries, the Marañon and the Ucayali. The Marañon, at a distance of about 200 miles above the junction, receives a large affluent from the south, the Huallaga, which reaches to the heart of the Department of Junin, close to the celebrated mining town of Cerro de Pasco. This was explored by our countryman, Lieut. W. L. Herndon, in 1851, who reported it navigable for a draught of five feet, at the lowest stage of the river, to Chasuta, or Pongo de Aguiré, 285 miles from its mouth, and for canoes from that point to Tingo Maria, a further distance of 325 miles. Prof. Raimondi, publishing in 1862, states, however, that the Huallaga, notwithstanding its great volume of water, is so obstructed that it cannot be steadily navigated by steamers of useful burden except to La Laguna, twenty-five miles from its mouth. It may, nevertheless, be navigated, at certain seasons, to the town of Yurimaguas.

The word *pongo* is a corruption of the Quichua *puncu*, portal or gateway, and indicates rapids or falls between

high escarpments of rocks, realizing what we have lately had described to us as the *canons* of the Colorado.

One of these *pongos*, the famous one of Manseriche, where the whole volume of the Marañon, which above that point is 1,800 feet wide, is forced between the precipitous rocks in a broken trough less than 200 feet broad, and with a current of fourteen miles an hour, effectually precluding steam navigation beyond. This *pongo* is about 400 miles above Nauta, and it is only to that point, where there is little population, that the Marañon can be regarded as a fluvial highway.

Coming back now to Ucayali, we find that, after all, it is the only stream likely to meet, in any great, practical sense, the idea of permanent or rapid communication between Peru, the Amazon and the Atlantic, or in its probable usefulness, as well as in length and volume, to indicate its right to the designation of Rio Madre del Amazonas. Like the Amazon, it takes its name only from the point where its two great tributaries, the Urubamba or Vilcamayo and the Tambo, itself formed by the Apurimac, and the Mantaro, come together. For its whole length, from the point of junction down to the Amazon a distance of 772 miles, it is a navigable river for steamers of large size and draft. The Urubamba, according to Castelnau, is navigable for small vessels for 216 miles, in the direction of Cuzco, to certain falls 180 miles below the Indian village of Echaraté, 220 miles from Cuzco, the capital of the most populous department of Peru, and with which, more than any other, it is important to establish communication from the Amazon. A sanguine German has proposed a railway up the valley of the river, from the head of steam navigation to the town of Urubamba, twenty-four miles from Cuzco, in the glorious valley of Yucay, but this would involve a road 400 miles long; but as two well-filled freight-trains a year would now carry away all the surplus produce of the department, and one car a month the total number of its travel-

ing citizens, I fear the project will not command the capital requisite for its realization.

The extent to which the Tambo, and after it the Apurimac and Mantaro, are or may be made navigable, I will not undertake to say. It has not been explored. Prof. Raimondi has penetrated, with infinite difficulty, from Huanta to the junction of the two rivers just named, when the united streams had sufficient water, in his estimation, to admit the use of small steamers all the year round. This point, according to the same authority, is in longitude  $72^{\circ} 32'$  west, and latitude  $12^{\circ} 30'$  south; and as the point of junction of the Tambo and Vilcamayo, or Urubamba, as recently fixed, is in longitude  $73^{\circ} 14'$  west, and latitude  $10^{\circ} 41'$  south, it follows that, if Prof. Raimondi is right, the Tambo is navigable for at least 250 miles.

The Ucayali is, therefore, following its windings, navigable, in connection with the Vilcamayo, 988 miles, and in connection with the Tambo, 1,022 miles; and as from its mouth to that of the Amazon is 2,609 miles, the total of navigation is 3,731 miles.

No attempt, however, has been made to utilize the Ucayali, except recently, and only so far as to establish steam connection with the department of Junin, by way of the River Pachitea, a considerable branch of the Ucayali, and the Palcazu, a tributary of the Pachitea. In June, 1866, an expedition, under Capt. Vargas, was sent from the Peruvian establishment of Iquitos, on the Amazon, to explore those rivers. He embarked in a little iron steamer, the Putamayo, of seventy tons register, twenty-five horse-power, and drawing only two feet of water. It safely navigated the Ucayali to the mouth of the Pachitea, and had ascended the latter stream about sixty miles, when two of its officers, Senores Tavera and West, who had gone ashore to communicate with the Indians on its banks, were attacked and slain. Owing to this circumstance—the steamer, meantime, having

suffered some damage by grounding—the expedition turned back:

A new and more effective expedition was, however, speedily organized by the young and enthusiastic Prefect of the Department of Loreto, Don Benito Arana, which embarked in three steamers, the Morona, drawing seven to eight feet of water, the Napo and the little Putamayo, already mentioned. It reached the point on the Pachitea whence the Putamayo had turned back, December 6, 1866, where a force was landed to chastise the Indians who had murdered Tavara and West. A number were killed and their village burned. The expedition then pushed forward, not without difficulty from narrows and shallows, and on the 8th of December reached the mouth of the Palcazu, and entered it for a short distance, when the Morona, the largest steamer, was compelled to stop for want of water, while the other two proceeded still a little farther on to the mouth of an affluent of the Palcazu, the Mairo, where it was proposed to establish a port, as the head of navigation, to be called, after the then president, Puerto Prado. The expedition remained a few days, dispatching a glowing account of its success to the government, by which it was proclaimed to the world that, as Mairo, or Puerto Prado, was only ten days distant from Lima (or but 325 miles), a direct route might be considered established, viâ the Amazon, between the Pacific and the Atlantic, between Lima and Para—the whole capable of being traversed in twenty-two days—twelve days being the time allowed by the enthusiastic Prefect Arana, in his official report, for the passage from Puerto Prado to the mouth of the Amazon, the whole distance, as was alleged, being practicable for vessels of 500 tons.

The expedition, on returning, was not so successful. The water of the Pachitea fell rapidly, and the Putamayo, which was the last descending, got aground, and remained aground for upwards of a year, or until the 12th of January, 1868.

Early in the year 1867, and in order to determine, with scientific accuracy, the capability of the route pointed out by the Prefect Arana, the Government of Peru appointed a Hydrographic Commission, a member of which was Dr. Santiago Tavera, brother of one of the officers already mentioned as having been killed by the Indians on the first trip of the Putumayo. His report, recently published, has just reached me from Lima.

This commission consisted of seven persons: three Americans, three Peruvians and one Swiss, with Admiral John R. Tucker, formerly of the United States Navy, but now in the Peruvian service, at its head. Starting from the so-called *Puerto Prado* in canoes and on rafts, they descended to the Pachitea in an hour, and the latter river to the Ucayali in six days, when they embarked on the steamer Morona, and in seven days, anchoring at night, reached the Amazon. Capt. Tucker subsequently ascended the Ucayali, making a regular survey of the river to the junction of the Tambo and Vilcamayo. He ascended the latter thirty-five and the former five miles, making all necessary observations for a map of this great river. His report is not yet published, and we only know some of the results from Dr. Tavera's pages.

From these we gather that from Puerto Prado to the Ucayali, following the Pachitea, is 195 miles; from the mouth of the latter to the Amazon, following the Ucayali, 575 miles.

The mouth of the Ucayali is in latitude  $4^{\circ} 30'$  south, longitude  $73^{\circ} 5'$  west of Greenwich.

The mouth of the Pachitea in latitude  $8^{\circ} 48' 28''$  south, longitude  $74^{\circ} 7' 40''$  west.

The junction of the rivers Vilcamayo and Tambo in latitude  $10^{\circ} 41'$  south, longitude  $73^{\circ} 14'$  west.

Dr. Tavera pronounces against Puerto Prado as a port, on the ground that the Palcazu is not properly a navigable stream, and is decided in his conviction that the head of navigation is at some point much lower down on the

Pachitea. Nor is he at all enthusiastic in favor of the proposed route to the Amazon, but strongly favors that proposed by the Viceroy Abascal in 1808, namely, by way of the Rio Chanchamayo, which, uniting with the Tutumayo and Pangoa rivers, forms the Perene, an important tributary of the Rio Tambo, entering it not far above the junction of the latter with the Vilcamayo. He thinks the Perene navigable to a point called Quimiri, not far from the frontier fort of San Ramon, sixty leagues from Lima. He estimates the distance from this point to the Ucayali at less than a hundred miles.

The government of Peru, with commendable spirit, sent last year (1869) an expedition under a Mr. Nystrom, a German, to explore this route. He penetrated only seven miles beyond Fort San Ramon, where his party became involved in a fight with the savage Chunchas, and he himself in a quarrel with the military officers accompanying the expedition, which consequently broke up without any valuable results. I believe the attempt to solve the question of a communication by this route has been renewed. If it should prove feasible, it will be clearly the best of all yet proposed to connect habitable Peru with the Amazon, especially as it starts close from the populous district of Tarma, which it is proposed to connect with Lima by railway,—a daring, but, it is believed, a feasible undertaking. A railway, on the other hand, to the Pachitea, is probably impracticable, although there have been engineers of sufficient hardihood to propose one from Lima to Cerro de Pasco, elevated 14,000 feet above the sea.

I cannot omit from these notes of what has been done and is doing in Peru, in the way of geographical exploration, without a reference to the liberality of its government in sending an exploring expedition up the Rio Morona, through its own territory into that of Ecuador. A citizen of the latter republic, a Senor Proano, under certain authorizations from his government, professed to

have discovered that the Morona was navigable to within 129 miles of the River of Guayaquil. Peru accordingly undertook to explore the Morona, and the steamer Napo succeeded in reaching a point at the confluence of two streams, the Lamar and Sucre Maisal and Cusilime, in the heart of the eastern ramifications of the Equatorian Andes, and, according to the report, "within two and a half degrees of the Guayaquil river. Senor Proano asserts the practicability of a railway to connect these two rivers.

The extent to which the conditions of mankind are influenced by natural circumstances, and how these may dictate, not alone the architecture and arts of a people, but their social, religious and political organizations, is, perhaps, nowhere better illustrated than in Peru. The Inca empire, it seems to me, was only rendered possible by the peculiar geographical and topographical positions occupied by the family or families that were its founders. Long antedating that empire, its vast area contained a great number of communities, tribes or principalities, more or less advanced or civilized, separated from each other, however, on the coast, by hot and almost impassable deserts, and in the interior by lofty mountains, or cold and trackless *punas*. They had but little intercourse or political dependence, and they all, when by means of alliance or conquest the enterprising families around Cuzco became consolidated, fell an easy prey to those inhabitants of the high, strong fastnesses or *bolsones* of the Andes. From their dominating position, the Incas were enabled to throw overwhelming forces successively on the isolated valleys radiating from their mountain center, and, one by one, mould them into the grandest of aboriginal American empires. It is easy to see how ambition, and the exigencies arising out of their aggressions, should have developed, gradually, that astute policy or statesmanship, that ability in

organization and administration, of which the Incas furnished such a remarkable example.

That portion of the Andean plateau lying between the Pass of La Raya, at the northern extremity of the Titicaca basin and the Pass of La Banda, near Pasco, is a great mountain-encircled region, drained by the River Ucayali, itself, as we have seen, formed by the Vilcamayo, Apurimac and Pampas flowing north, and the Mantaro flowing south. The beds of these streams are deep and narrow, being merely gigantic canals or drains for the waters collected in numberless vales among the mountains. Nothing better describes these vales than the Spanish word *bolson*, or pocket. And, as I have said, while the valleys of the coast are separated by deserts, these *bolsones* are isolated by ranges of hills, mountains, or uninhabitable *punas*, and all these are divided into groups by the great rivers, which, like the Apurimac, are intransitable except by the aid of bridges of *mimbres*, or cables of braided withes swinging dizzily in mid-air.

These *bolsones* are of varying altitudes, and, consequently, of various climates or productions. Some are well drained, others are marshy and contain considerable lakes. They discharge their gathered waters, often in large streams that plunge, in numberless cataracts, through dark and narrow ravines into the gorges of the great rivers. The passage from one *bolson* to another is over the intervening elevated ridges and *punas*, frequently among frost and snow, and always by rocky and difficult paths, fit only for the vicuna and the llama.

It was in precisely one of these *bolsones*, the central one of a group or cluster lying between the Vilcamayo river and the Apurimac, that the Incas built their capital. It is not only central in position, salubrious and productive, but the mountain barriers that separate it from its neighbors are relatively low, and subside into passes that may be traversed with comparative ease, while they are,



at the same time, readily defensible. The rule of the first Inca does not seem to have extended beyond this valley, and the passes leading into it are strongly fortified with works that face outward, indicating the directions whence attack was possible in the early days of the empire, before the chiefs of Cuzco commenced their career of conquest by reducing the people of the *bolson* of Anta or Xaxiguana on the north, and of Urcos or Andahuaylillas on the south.

The *bolson* of Cuzco, which is not far from thirty miles long, is divided into two nearly equal parts by the Pass of Angostura, or the Narrows, where two mountain spurs project towards each other into the valley, leaving hardly room enough for the roadway and the river. On the promontories dominating this narrow passage are the conspicuous ruins of many buildings and remains of works, showing that this was regarded as a strategic or important position, for the immediate protection of the capital.

The city of Cuzco, which occupies the site of the ancient capital, stands at the northern or most elevated extremity of the *bolson* or valley, on the lower slopes of three high hills, the Carmenca, Sacsahuaman and Cantuta, where as many rivulets, the Almodena, Huatenay and Tullamayo or Rodadero, coming together like the outspread fingers of the hand, unite to form the Cachamayo, which drains the valley, and falls into the Urubamba. The old city, or rather that part of it dedicated to the royal family, was built on the tongue of land falling off from the hill or headland of the Sacsahuaman, between the Huatenay and the Rodadero.

The position of the city, as determined by Mr. Pentland, is latitude  $13^{\circ} 31'$  south and longitude  $72^{\circ} 2'$  west of Greenwich; its elevation above the sea 11,380 feet. Surrounded by high and snowy mountains, it might be supposed to have a cold, not to say frigid, climate; but in fact its temperature, though cool, is seldom freezing,

and although in the dry season, or what is called winter, from May to November, the pastures and fields are sere and the leaves fall from all but quenua trees, yet all this is rather from drought than frost. On the whole, the climate is equable and salubrious. Wheat, barley, maize and potatoes ripen in the valley, and the strawberry, apricot and peach are not unknown. The climate of Nismes, and of the south of France generally, is much the same with that of Cuzco during the summer months. When we add to those favorable conditions that not more than thirty miles distant are deep, hot valleys, where semi-tropical fruits may be produced abundantly, we may comprehend that Cuzco was not an unfavorable site for a great capital.

Its geographical position, as regards the country at large, as I have said, was also such as to make it a citadel and the dominating center of an empire. Its very name, if we credit the chroniclers, signified *umbilicus*. The Inca power once fairly established in the cluster of valleys, of which I have spoken, and with the few and narrow passes by which only they can be reached, strongly fortified as they were, it was comparatively easy, as I have already said, for the Incas to overwhelm the inhabitants of the long and narrow valleys running down the slopes of the Andes and the Cordillera, and to subdue, one by one, the families dwelling in the *bolsones* northward to the equator, and southward beyond the desert of Atacama—an extent of thirty-seven degrees of latitude.

We are told that Cuzco, in its construction and arrangement, was a *microcosm* of the Inca empire, and, in common with the country at large, was divided into four quarters by four great roads running in the direction of the cardinal points. The roads do not, however, take these directions, but run intermediately to them. The road extending north-east and south-west from Cuntisuya to Antisuya bounded the Huacapta, or great square, as will be seen by the plan, on its south side, and divided the

city into two very nearly equal parts ; the more elevated part, in the direction of the hill and fortress of the Sacsahuaman, being called *Hanan*, or Upper Cuzco, and the lower part *Hurin*, or Lower Cuzco. Grouped around the central square, in the form of an oval, were no less than twelve subdivisions, or *barrios*, the names of most of which are still retained. The most important part of the sacred city was the spur of the hill of the Sacsahuaman, extending down between the rivulets Huatenay and Rodadero—a tongue of land, calculating from the terraces of the Colcompata, where the first Inca built his palace, to the confluence of the two streams, a mile in length by a quarter of a mile broad. Within this area, on ground sloping to the valley in front, and to the rivulets on either hand, the royal *ayllos*, or lineages, had their residences. Here were the palaces of the Incas, the buildings dedicated to instruction, the great *galpones* or edifices in which festivals were held, the convent of the Virgins of the Sun, and situated far down toward the Pumapchupam, or tail of the Tiger, in the district called *Coricancha*, or Place of Gold, the gorgeous temple dedicated to the sun, with its chapels sacred to the moon, the stars, the thunder and the lightning. It was here, after the Conquest, that the conquistadors obtained their *repartimientos* of land, and on the ruins of the Inca palaces reared their own *parvenu* edifices. Over the imposing gateways of the Inca dwellings, which they preserved as entrances to their own, we still find, carved or stuccoed, the arms of Pizarro, Almagro, Gonzalez, Quinones, Valdivia, and Toledo. By a coincidence, perhaps not wholly accidental, the convent of Santa Catalina was raised on the site, retaining in great part the very walls, of the *Acclahuasa*, or palace of the Vestals of the Sun, and the temple of the Sun itself became the convent of the monks of Santo Domingo.

All over this narrow tongue of land we still find the evidences of ancient greatness, as exhibited in Inca archi-

ture, which here, as elsewhere, has an individuality as marked as that of any nation on earth. The streets of the new city are almost coincident with those of the old, and are defined by long sections of Inca walls, built of stones elaborately cut, and fitting together with an accuracy not excelled in any of the structures of Greece or Rome, and which modern art may emulate, but cannot surpass.

I made a careful survey of Cuzco, with the aid of two engineers, Messrs. Davis and Church, and have laid down in the map before you, in red, the remains of the walls of the ancient buildings. Of the temple of the Sun, the convent of the Vestals, the palaces of Yupanqui and the Inca Rocca, and of the alleged palace of Manco Capac himself, as well as of the *yachahuasi*, or schools, important and often imposing vestiges still exist, of which I have accurate plans. Enough of the temple of the Sun remains to determine its plan and character. But it would be impossible for me to go into any detailed account or description of these remarkable structures, or of the others which have justly given to Cuzco the title of the Rome of the New World, and made it, archæologically, the most interesting city of America.

I cannot, however, close these very discursive observations without a single reference to the great fortress of the Sacsahuaman, which dominated the city of Cuzco, the stronghold of its rulers, the work of three reigns, and which the chroniclers characterized as the eighth great wonder of the world. I present you with an accurate plan of the work, the result of a careful survey, with enlarged horizontal sections showing its gateways, and vertical sections showing its construction.

This fortress is built on the bold headland extending into the valley of Cuzco, between the rivulets Huatenay and Rodadero. This headland, which rises 760 feet above the great plaza of the city, looks from below like a high, abrupt hill; but it is really only a projection of

a narrow, irregular plateau, which, in turn, is commanded by higher hills, or apparent hills, themselves the escarpments of remoter terraces.

Towards the city, the eminence of the Sacsahuaman presents a steep and almost inaccessible front, up which, from the terraces of the Colcompata, led anciently, as now, a zigzag road, ascending in places by steps, to a series of terraces on the most projecting and conspicuous portion of the headland. The usual ascent, practicable by horses, is through the gorge or ravine of the Rodadero. The mass of the hill is a metamorphic rock, hard in parts, and disintegrating in others, thrust up by igneous action from below, and bearing on its surface huge blocks of limestone from the neighboring cliffs, a tumultuous piece of natural rock-work, which it would require an accomplished geologist to describe. Back of the headland is a level area or plain, in which rise the amphibolic rocks called "El Rodadero." In this direction the Sacsahuaman presents a front curving slightly inward, and it is along this face that the heaviest works of the fortress were raised. They remain substantially perfect, and will remain so, unless disturbed by a violence not to be anticipated, and of which the present inhabitants of Cuzco seem hardly capable, as long as the Pyramids shall last, or Stonehenge and the Coliseum endure; for it is only with these works that the fortress of the Sacsahuaman can be properly compared.

The defenses consist of three lines of massive walls, each supporting a terrace and a parapet. These walls are nearly parallel, and have approximately accurate entering and re-entering angles, for their total existing length of 1,800 feet. The first or outer wall has an average present height of twenty-five feet; the second wall is about thirty feet behind it, and is eighteen feet high; the third wall is about eighteen feet behind the second, and in its highest part has fourteen feet of elevation. The total elevation of the walls is, therefore, about fifty-seven feet.

I am speaking exclusively of the walls on the northern front of the fortress. Long lines of walls extend along the heights dominating the gorge of the rivulet Rodadero, and there are sections of walls on the brow of the hill on the side of the city. As these were constructed of regular, squared stones, they have been almost wholly destroyed, the stones having been rolled down the eminence and used for buildings in the modern city.

A remarkable feature in the construction of the fortress, on its only assailable side, is the conformation with modern defensive structures in the employment of salients, so that the entire face of the walls could be covered by the enfilading fire of the defenders. This feature is not the result, in any degree, of the conformation of the ground, but of a clearly settled plan.

The stones composing the walls are massive blocks of blue limestone, irregular in size and shape, but accurately fitted together, the whole forming, without doubt, the grandest specimen of the style called *cyclopean* in all the Americas, if not in the world. The outer wall is most massive. Each salient terminates in an immense block of stone, sometimes of the height of the terrace it sustains, but generally supporting one or more other blocks only less in size than itself. One of these stones is twenty-seven feet high, fourteen broad, and twelve in thickness. Stones of fifteen feet length, twelve feet width and ten feet in thickness are common. All the stones are slightly beveled or rounded on the face, but cut down sharply toward the joints, as we see in some of the Florentine palaces. They fit together with wonderful precision. The inner walls are of smaller and more regular stones.

Each wall supports a terrace or platform, and the summit of each was anciently crowned with a parapet. The chroniclers speak of only three gates; but there were five in all. The main entrance was near the center of the line of walls, where one salient was omitted, so as to leave a rectangular space, sixty-three feet long by twenty-five

feet wide. In the center of the left-hand end of this space, between two enormous blocks of stone, was and is an opening four feet wide, in which are steps leading up to the first terrace. The entrance through the second wall is more intricate, and opens against a transverse wall, where the steps turn at right angles, and thus reach the second terrace. The third wall has a double entrance, one plain like that through the first, and the second corresponding with that through the second or intermediate wall. The lesser entrances, to the right and left of the principal one just described, are simple openings occurring not opposite each other, but in alternating salients. The chroniclers state that these various gateways were closed by closely-fitting blocks or slabs of stone, and, in fact, some of these remain.

The ground within the walls rises to a further elevation of sixty feet, and is rocky. Several blocks of metamorphic rock and limestone project above the soil, and are cut into gradients, and otherwise carved. Here are fragments of the foundations of considerable structures, of regularly cut stones, but of which the plans cannot now be made out—the remnants, probably, of what the chroniclers describe as three small fortresses or citadels within the greater work. The declivities of the whole interior of the fortress seem to have been graduated by terraces, faced with cut stones, of which, however, few remain, although many of the terraces are themselves distinct. Prescott has given the name of “The Fortress” to the three towers alleged to have existed on the hill of the Sacsahuaman, and mistakes in supposing that there were but two lines of walls on the side next the rocks of the Rodadero. Water was conducted into the fortress through *azequias* and subterranean passages, some of which still exist and are in use.

I have said that the stones composing this fortress are limestone, and that masses of the same still lie within its walls, and on the plateau behind it. That some of those

entering into the construction of the work were taken from their natural positions near the places where they now stand is most probable ; but that most of them were brought from the limestone cliffs or quarries, on the edge of the superior plateau, is certain. Two distinct, well-graded roads still exist, leading to these quarries. Hewn blocks still lie by the side of these roads, and others remain in the quarries themselves. The great *pedra cansada* or *Sayacusca*, of which Garcilasso and others speak, as having required 20,000 men to move it, and which, in rolling over, killed 300 workmen, is an enormous mass of rock weighing 1,000 tons or more, and certainly was never moved by human hands. Its top, as are the summits of hundreds of other rocks on the plateau of the Rodadero, is cut into what appear to be seats, and reservoirs of every shape, and its sides are cut into niches and stairways, the whole forming a maze of incomprehensible sculpture and apparently idle but elaborate labor.

It is a mistake of Garcilasso that the Fortress of Cuzco could not be commanded, not even by artillery. It is commanded in great part by the heights of the Rodadero, and entirely by the adjacent hill of Cantuta. Still, it was no doubt an impregnable fortress under the system of warfare practiced in ancient times.

From this brief sketch of the Fortress of Cuzco, I think you will agree with me, that it is one of the most remarkable single, independent, aboriginal structures in America. There are other works like the Fortress of Ollantaytambo, and like the mountain stronghold of Pisac, that cover greater areas ; but they are rather aggregations of works, and do not have that individuality and salience possessed by the Fortress of the Sacsahuaman.

I must, in conclusion, ask the indulgence of the Society for presenting a paper so hurried, discursive and incomplete as this. It would, perhaps, have been better to have confined myself to a single point ; but, in a field so rich,



archæologically and geographically, as Peru, it would be difficult, if not impossible, to make a selection of such a point, or to treat it independently of its necessary and intimate relationships. I hope, however, that at no distant day I shall be able to lay before the Society and the world the matured results of my researches in a country which scholars as eminent and travelers as enterprising as Condamine, Castelnau, D'Orbigny, Von Tschudi, Sartiges, Angrand, Weddell, Desjardins, Boellart, Forbes, Markham and Raimondi, have found so worthy of their labors, and which yet offers so wide a field to the explorer and the student.

## IX.

## JOURNEY THROUGH EASTERN MANTCHOORIA AND KOREA.

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BY WALTON GRINNELL.

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READ JUNE 18TH, 1871.

MR. PRESIDENT AND MEMBERS OF THE GEOGRAPHICAL SOCIETY: In the remarks which I will have the honor of presenting to you this evening, I shall confine myself to that part of Asia lying between the great river Amoor, on the north and the frontier of the Korea on the south, embracing portions of Chinese and Russian Mantchooria, between the Shan-a-lin mountains and the Gulf of Tartary.

The spring and summer of 1870 I had spent in cruising among the Kurile Islands and in a land journey through Kamchatka and north-east Siberia; but in September of that year I found myself landed at Vladivostok (the Port May of the English charts), on the Gulf of Tartary, in lat.  $42^{\circ} 50'$ .

I had two reasons for being dropped at this rather out-of-the-way spot. The first and prime object of my whole journey was to attempt to reach Samarkand and Central Asia from some point on the Gulf of Tartary, between the  $37^{\text{th}}$  and  $45^{\text{th}}$  parallels; and, secondly, I had cherished a hope of crossing the Korean frontier and of learning something regarding that strange, sealed empire and its interesting population. In neither of these attempts was I entirely successful, though my failure by no means convinces me of the impossibility of the undertaking.

By the supplementary treaty of Aigun, Count Moura-

viess obtained for Russia possession of that vast and fertile territory lying south of the Amoor and between the Gulf of Tartary and the river Usuri, and with an energy and enterprise which have characterized Russian progress during the last ten years, she has encouraged emigration, placed steamers on the Usuri and Lake Hanka, built the port of Vladivostok, constructed a telegraph from the Baltic to the Pacific, and enforced order among the Manjoors and other tribes. A considerable experience in traveling in little-known countries had prepared me for the exclamations which met me on all sides. At Vladivostok: "What! cross Mantchooria and Mongolia to Samarkand! Impracticable, can't be done; and as for the Korea, absolutely impossible!!" Faint-hearted indeed must be the traveler who, having determined on an attempt, is thwarted from his purpose by such exclamations or the discouraging advice of timid friends. \* Vladivostok is an admirable harbor, and has the advantage of being closed only about six weeks by ice. It has a mixed population of Manjoors, Chinamen from the northern provinces, Korean refugees and a few Russians, in all, perhaps, 400 inhabitants. It has a small trade in exporting sea-weed, ginseng, etc., to China. The Russian government have lately decided to remove here the naval arsenal of Nikolaeivsk on the Amoor, and during the present summer it will be connected with China by the Danish submarine cable, and with Europe by the Siberian military telegraph. Thus it will be seen that this little port bids fair to "have a future," and at no distant day it may form the base of operations directed against the Korea.

On landing at Vladivostok I was received by the Russian authorities with that hearty hospitality and good-will which, during a year's experience in many parts of the Russian possessions, I have never once found wanting; and on stating my objective point, I was offered every facility in the way of passes, escorts and transportation. It was the middle of September, however, before I was

prepared to start, and through the courtesy of the commandant of Vladivostok I was landed by a Russian man-of-war at the mouth of the Siphon, a river flowing from the water-shed of the Shan-a-lin mountains into the Bay of Amoor. The Siphon is a shallow stream flowing through one of the most beautiful valleys imaginable. During the first day's ride I met no traces of cultivation, but tracks of big game met us on every side; tigers, swine, panthers and deer are numerous, and the river and lagoons were alive with wild fowl. In the course of a few days I arrived at Nikolskoi, a Russian post on the Siphon, about sixty versts from its mouth. Two years before my visit, this post was attacked and destroyed by a band of Man-joor outlaws, but at present a guard of Cossacks give it some protection. It was here that I first learned of several considerable villages of Koreans scattered in the fertile valleys to the westward, and I at once determined to visit them and, if possible, to reside some weeks with these people before crossing into the Korea proper.

Here again I was befriended by the Russian officials, and one bright morning in October I found myself well mounted and with a Korean guide on my way to a village of 500 souls, said to be situated about forty versts to the west, near the base of the Shan-a-lin mountains.

It was a new field, full of interest. Many centuries ago this portion of Mantchooria formed a part of the Korea, and the numerous remains of walled cities and forts attest the power and civilization of the Korea at that period. Our trail, on leaving Nikolskoi, led us through a finely preserved Korean remain—a rectangular fortress, with well shaped walls of earth thirty or thirty-five feet high, and protected by a moat and two outer ditches. The work covered about six acres, and had four gateways, guarded by curtains of earth-work. I afterward examined this work more thoroughly, measured its side, and saw some stone statues, and elaborately carved fragments of columns.

The valley of the Siphon is a promising field for colonization. Corn and millet grow luxuriously; and the Manjoor, even with his rude cultivation, produces bountiful crops.

During my stay in the Siphon district vast tracks of grass lands were on fire, and I was often compelled to make long détours to escape the flames.

Toward nightfall we arrived at the first village of Koreans. It was a thrifty little hamlet on the hill-slope, straggling down to the valley below. The general effect was purely Japanese; the grouping of the houses, their structure (except the detached chimney), the neat fencing of interlaced boughs, and the well-laid thatch, formed a marked contrast with the miserable cabin of the North China peasant, or the mud-built fanzar of the Manjoor.

My guide was soon surrounded by friends, and so presented me to the chief, or head man of the village, that we were most cordially received.

On entering the house we found the whole family squatted on the matting. The women were engaged in mending their slender wardrobes, and men were fashioning clay bowls, which were neatly done, and graceful in shape.

A Korean house, at least those of the Northern provinces, is built of a light frame-work of bamboo, or reeds, fastened together by cords, and filled in with clay. The outside is covered with a light planking; and the roof formed of thick thatch, or sun-burned tiles. Connected with the house, though standing some distance from it, is the chimney, formed of a hollow tree. The interior is generally divided into two or three apartments, the floor being raised some two feet, and heated from underneath by a system of flues, which connects the fire-place with the chimney. By this arrangement these flimsy houses are made most comfortable, even during the severe winter of this region. The Korean eats, sleeps and works on this heated platform, which is covered by a matting of straw,

or split reeds. I was given a most excellent supper of fresh venison and boiled millet; and I was charmed by the refined and cleanly manner in which it was served. I had taken the precaution to bring with me some Chinese tea; a gift of a few handfuls of which placed me on the very pinnacle of popularity; for tea is a luxury almost unknown to these poor refugees.

There are about 5,000 Koreans settled north of the Tamen, principally peasants from the Northern province, and, consequently, knowing but little of the Southern parts of their empire. I spent some weeks in different villages, and, through my guide, who spoke a little Russian, I continually questioned the Koreans regarding their country and its customs. The result of this questioning, and of my own observations, I have condensed into the following notes:

The Korea is, as we know, the peninsula which forms the north shore of the Yellow Sea, and lies between  $35^{\circ}$  and  $43^{\circ}$  N., and  $125^{\circ}$  and  $129^{\circ}$  E. from Greenwich. It has an area of about 81,000 square miles, and a population of about 6,000,000. Of the geography of this country we know next to nothing. Indeed, the coast line is but imperfectly described on our charts; and all attempts to communicate with its people, or to land on their shores, have been successfully resisted.

The Korea is an independent empire. It is true, an annual tribute is sent to the Emperor of China; but this is by no means a token of actual dependence. The empire is divided into eight provinces. The capital, or royal city, is Si-oo-ri, called, on our maps, King-ki-tao; the name given it by the Chinese, and one not in use among the Koreans. There are many large cities; but in the north the population is neither so numerous nor so cultivated as in the south and central provinces. Many of the cities have walls of stone thirty or forty feet high; and there are castles or forts in different parts of the empire. Soldiers are numerous, and armed with gin-

galls and bows ; and iron and chain armor is still in use. Cannon, great and small, of brass and iron, are mounted on the castle and city walls. I could learn of no wars nor rebellions of late years. The climate is magnificent, and cotton grows as far north as 40°. Hemp and flax are largely cultivated, and, from the cloths and ropes I saw, they must be of excellent quality. Tobacco is extensively grown and incessantly used ; a pipe, with a Korean, being as much part of his costume as his jacket. Rice is found in the Northern province ; but a species of very small millet seems to be the staple food of the lower classes. Paper is made from the bark of a tree (a species of mulberry) ; and I saw many qualities, all good, and some finer than any I had seen in Japan. The Korean, like the Japanese, uses paper for everything. The windows of his house, the walls of his rooms, his water-proof overcoat and his umbrella, his pocket handkerchief and his pillow-case, are all made of this paper, and it has many advantages. The Koreans excel in metal work ; and nearly all household utensils are made of a composition resembling bell metal, and very light colored, from the great alloy of silver.

I saw but few specimens of lacquer, which was of inferior quality. The carpenters and joiners are very clever, and use tools similar in shape to those of China, though of better finish.

The universal, national dress is white, of silk or cotton with the richer classes, and of hemp or bleached grass cloth with the poorer. The dress of the women consists of a skirt or petticoat, padded or quilted in winter, reaching nearly to the ankles. Underneath they wear a garment not unlike Turkish trowsers. The upper dress is a jacket, or bodice, fastened at the neck and reaching but half way to the waist, and tightly laced, compressing to the utmost the upper part of the body. They wear large chignons. Otherwise the hair is simply dressed. I noticed, even with the poor people with whom I lived,

gold and silver rings, and long skewer-like hair pins of the same metals. The men wear a short jacket, like the Japanese Kimino, and loose breeches, gathered in at the knee. For shoes, both sexes wear a pointed sandal of straw or cotton twine.

The Koreans marry at thirteen or fourteen; and I have seen a girl of fourteen with her two children on her back.

The men's hair is worn drawn tightly to the top of the head, where it is tied in a large knot. The boys wear a pig-tail like the Chinese, which is cut off on their marriage and sold for making chignons. For a head covering they wear a hat made of open worked horse-hair.

The type of the Korean is purely Mongol, though of lighter complexion and more robust figure than the Chinese or Japanese. The women are often very pretty, with well shaped hands and feet, and they are most graceful in all their movements. In manner they are exceedingly pleasing and reserved. I have never been with a tribe, from the Tchuktchees of Behring Straits to the Steppes of Patagonia, so rude or simple as to be ignorant of the gentle art of flirting; but your Korean young lady is the most accomplished of coquettes. The women seem well treated, and do no hard work, and the children are most tenderly cared for. In short, from my own experience, the Koreans are a thrifty, brave and honest people, with considerable civilization and much good nature. Education is widely diffused; and I did not meet, even among those poor villagers, a single man who could not read and write. In reading, they articulate in a sing-song fashion, connecting words and sentences, and making no stops or rests. The literature of the Korea is said to be very extensive; and the jealousy of the government is so great that any one sending a book or manuscript across the frontier is punished with death. Nevertheless some works in Korean can be bought at Pekin. The works on history, philosophy and the sciences, are printed in the



Chinese characters; while all lighter literature, such as poetry and romances, are in the native Korean letter.

The language of the Korea is alphabetical, and composed of 187 letters; it differs entirely from Chinese or Japanese, and has many curved strokes and circles. In simplicity, it resembles the Kata-Kara of Japan. When spoken, one is struck by the softness of pronunciation, and by the musical modulation of the voice in strong contrast with the harshness of the Japanese, and guttural emphasis of the Chinese.

The domestic animals of the Korea are the same as those of northern China, but the horses I saw were much finer than the Mongolian ponies. Game abounds, from tigers downwards. The system of cultivation is, as in China, extensive and thorough, and the roads and other means of communication are described as numerous and well kept. The popular religion is Buddhist, but many of the villages I have been among have lost their faith, though a joss picture forms part of the furniture of their houses. The Russians have made a few converts at Hadirostok. The trade with China has of late years greatly diminished, and, with Japan, has entirely ceased, owing to the jealousy and restrictions of the Korean government.

It has often been fancied that the Korea was exceedingly rich in the precious metals. I have seen silver plates and golden ornaments from there, but I see no foundation for the idea of superabundance of these metals. The villagers told me that gold and silver were held in the same value, and that neither were used as money, except near the capital, where they had heard of blocks of silver, probably for trade with the Chinese. The money of the country is of iron and copper, similar to the money of China.

The general aspect of the Korea is mountainous, the greatest elevations being in the north, and sometimes rising to 6,000 or 8,000 feet and approaching close to the sea. As we sail along the coast to the southward this range appears

to leave the coast and to tend to the south-west. Of the water system, the Ya-la river, which probably takes its rise from the water-shed of the southern spur of the Shan-a-lin mountains and falls into the Yellow Sea near the Chinese frontier, is the most considerable, and is navigated by junks of the first class for sixty or eighty miles. The second river in point of size is the Tumen, which forms the northern boundary of the empire. Where I met it, at the Russian frontier, it is 200 yards wide; but the bar, which has been examined by the Russians, and I believe by the English also, has only about six feet of water, and is exposed to the swell of the Japan Sea. The Tumen is frozen many months in the year, thus forming a bridge over which the poor people with whom I lived, driven by famine from their own country, escaped to the protection of China and Russia. The jealousy of the Korea of the inviolability of the empire is so great that during the last century all the villages, farms and houses on their banks of the river were ordered to be destroyed, and death was the punishment for crossing from shore to shore.

There are many harbors on the east coast, and ships passing up the Gulf of Tartary have often found good shelter, but the whole coast requires examination before it is safe of approach. Of the Archipelago, to the south-west, we know absolutely nothing, which is doubly to be regretted, as the merchant ships from Nenchiang to Japan are often driven into this bight and find themselves surrounded by unknown dangers.

The problem of opening this strange empire to western commerce has been tried by France and Russia, and both attempts ended in discouraging failure. That the efforts of this country, now being made through Admiral Rodgers and Mr. Low, our Chinese minister, will prove more successful, I greatly doubt. Suppose we appear off the coast with a powerful fleet and succeed in landing, we have no power to assure our communications or of reaching the government at Livori, neither can we force the

officials of the capital to come to our ships and to treat with us.

The Korea is as invulnerable as China. Her capital, all her great cities, and her wealth and industry, are away from the coast. We cannot force the government into receiving us, by bombarding a few harmless fishing villages, and it will not listen to conciliatory diplomacy. No, if we wish to sell our gray shirtings and our repeating rifles, if we covet her gold, her copper and her coal, and if we think her advantageous to swallow, we shall have to go to Sioori, and to tell the Emperor so, in his own palace; and to do that we should have at least 10,000 soldiers for our traveling companions. The opening of Japan was by no means an analogous case. Our triumph there was due to the personal courage, persistency and diplomatic adaptation of circumstances of our minister, Mr. Townsend Harris.

In concluding these notes on the Korea, I would remark that I believe a determined traveler, who is ready to spend six or eight years in the exploration of that country, can accomplish his object by residing in the villages of refugees, spending a year or two in studying the language, and in making short excursions across the frontier. On his final attempt he must expect to be made prisoner, but by tact and knowledge of the language, he may make himself so valuable as to be detained or even employed by the government, and like Will Adams, the first Englishman in Japan, live to give a thorough account of the country. The results are quite worthy of the risks attending the attempt.

On leaving the Korean villages, of which I have visited several, I made a *détour* from the trail to visit a hill fortress of Korean origin, of which I had often heard.

Differing from the work I had seen at Nikolskoi, this fort was perched on the crest of a considerable hill, which here rises from the valley. Its walls were well defined, and at the four angles were towers, or high traverses,

rising fifteen or twenty feet above the main wall. The extreme antiquity of these remains was attested by the full grown forest trees growing on the walls and within the inclosure. Great quantities of small rectangular bits of iron have been found here by the natives, which I immediately recognized as portions of scale armor, similar to that worn by the Japanese. I found the longer side to measure 2,400 feet, and the lesser 752 feet.

The country south of the Siphon completely changes in character; the extensive plains and low, unwooded hills give place to rugged forest-clad mountains, intersected by numerous valleys, and swift-flowing torrents falling into the Bay of Amoor.

On the hills we started herds of deer, and as we forded the streams, we literally rode through shoals of salmon. These fish, after entering a river never return, but, mounting to the head-waters, are left by the receding current to die, and become food for the bears, which here abound.

On the 12th of November I reached the beautiful valley of Mon-go-gaile, where the Russians propose planting a colony. A cart-road of Mantchoor origin intersects the valley, and a bridge, the first I had seen, spans the river. This, with the ruins of a few fanzars and millet mills, are the only signs of its former population.

It is said that valley was abandoned because of the ravages of tigers. The Manjoors assert that a tiger will never pass over burnt ground; but this precaution does not prevent the loss of cattle, even when inclosed in the strong high palisades which are always to be found on a Manjoor farm in this district.

The climate of these valleys is much warmer than the surrounding country; all cereals grow luxuriantly. I passed several groves of cork trees, with a bark of four or five inches, and wild grapevines interlace the forest.

On returning to Nikolskoi, which I did at the end of November, I found the Russian bishop of Peking, who

had made the journey from thence *via* Neoukden and Ningorta, and whose wonderful facility in the Chinese and Manjoor dialect, and knowledge of Northern China, gave his opinions great weight. On conversing with this distinguished traveler, regarding my plan of crossing Mantchooria and Mongolia to the desert of Gobi, he assured me of its impracticability, and, moreover, stated that from information he had gained from the Chinese of those districts, the country was but thinly settled and comparatively uninteresting. It is very cruel to one's pride, and very demoralizing to one's stamina, to abandon a long matured plan; still, traveling is not a worthy occupation if used as a mere means to display courage, daring or endurance. The true traveler struggles through difficulties to accomplish a defined object, and to return with definite results.

At length I determined to abandon the Korea, and the idea of reaching Samarkand by Mantchooria, and resolved to push to the Amoor; from thence reach Irkutsk, in Central Siberia, with all possible speed, and from there work down to Samarkand, through the desert of Gobi. With this idea in view, I left Nikolskoi on the 6th of December.

The thermometer stood at 3° F.; our road was due north and the weather was piercingly cold; besides, I was in no way prepared for such a temperature, and I had 120 versts to make to reach Lake Hanka, where I could hope to find some fur clothing. The road was detestable, and the country most dreary, a rolling *tendra* or wet prairie. The eye searched in vain for a tree, a shrub or a blade of grass, and the only verdure was a long moss, dead and whitened by frost. I passed only one Mantchoor Fanzar, in which were two old Chinese, self-exiles, who buried themselves in this dreary region years and years ago to escape Chinese justice. More miserable specimens of wrecked humanity I never saw, and their Fanzar or house was as tottering and decrepit as them-

selves. Nevertheless, I was heartily glad to share with them their warm shelter, with its bugs and vermin, from which I received marked attentions.

I passed several skulls and human bones of victims in some battle, and the plain was strewn with the whitened remains of deer and other game.

On nearing Hanka, the Shan-a-lin mountains approach close to the lake; but the country to the south and east is monotonous and prairie-like.

The Russians have established a port at Kama-Ribaloff, on a bluff overlooking the lake, and during the summer it receives supplies by steamer from the Amoor, by the Usuri and Sangashi. By this magnificent system of rivers, Vladivostok, on the Gulf of Tartary, is in almost direct water communication with Irkutsk, a distance of over 3,500 miles.

Lake Hanka is situated between latitude  $44^{\circ} 30'$  and  $45^{\circ} 20'$ , and longitude  $131^{\circ} 50'$  and  $132^{\circ} 30'$  (approx.), and has an average depth of ten fathoms. The boundary between Russia and China crosses it from south-east to north-west. The shores, except in the vicinity of Kama, are low and marshy, and I traveled for ten days on the Chinese portion without meeting a sign of human habitation. The lake was firmly frozen. Once I crossed from the Russian frontier to the Chinese shore, over the ice—a most arduous undertaking, for great hummocks, sometimes forming ridges of fifteen to twenty feet high, impeded our progress, and I lost one of my horses in an air-hole.

I had managed to get a good outfit of furs at Kama-Ribaloff, and with my bearskins for bed and cover, I did not suffer from the cold, though the thermometer averaged  $5^{\circ}$ .

On December 14th, I arrived at the mouth of the Van-gachi, a river which flows from the lake, and after a north-east course of 200 miles, falls into the Usuri. The Sangashi is a deep, narrow stream, with a strong current,

and never frozen at its head. The country along its banks is a vast sundra, or marsh, almost impassable. No snow had yet fallen, and the ice was not in a fit condition for sledging, so I was compelled to plod through this dreary waste for two days before reaching the Kossack settlement of Makora, on the Sangashi, near its junction with the Usuri. The character of the country here changes, and the interminable marshes of the upper river give place to wooded slopes and undulating banks.

I struck the Usuri about 150 miles from its source, and found it a magnificent stream of 500 feet wide.

The ice was reported in good condition, and having procured a sledge, I had the cheering prospect of easy traveling for 350 miles, and of meeting occasional villages of Chinese and Kossacks.

The Usuri flows through a rich, well wooded country; the banks often rise to considerable elevation, and on the Russian shore we passed several villages of Kossacks, who cultivate a small patch of ground, and hunt the sable, fox, bear and tiger, which abound in this section. The sable of the Usuri is not so valuable as that of Kamchatka, though a good skin readily brings from twenty to twenty-five rubles at Hebarofka, or other large trading-posts, and a tiger skin is worth from sixty to 100 rubles.

The left bank is occupied by Chinese and Goldi. The Goldi are a tribe of Mongol origin, long inhabiting this country, and spreading as far as the lower Amoor and the country of the Ghilasks. They have no written language; a religion and customs different from the Chinese; and are generally fishermen and hunters. They are a peaceful, hard-working, and stupid race, short of stature, and with features a cross between the Chinese and Esquimaux.

We often passed solitary little temples or Buddhist shrines, and I stopped at many of the Chinese farms. They generally have large, well built Fanzars, with courtyards like those in Northern China. Much ground is

under cultivation, and they seem well supplied with horses and cattle. In winter they use the Narta, or light sledge, with dogs, as a means of transportation.

I passed a night at one fanzar, at which there were at least twenty persons. The head of the family was a fine old Chinaman, who, being rich, had surrounded himself with many of the luxuries of his country. His wife and children were dressed in rich silks, and wore bracelets of gold and silver, and ear-rings of jade.

The elder members of the family smoked opium incessantly, and it was late in the evening before they fell over on the ka-hu in a drowsy sleep. During the night they would wake and the porcelain pipes and little oil lamp were always in request. For a few silver rubles I bought from these people a white sable skin, a variety I had never seen before, and one much prized in China and Russia.

As we proceeded, the Russian settlements became more numerous, and Boussi and Kasákiricha are well built villages. For the last 100 versts the banks are high and bluff-like, and at forty versts from its mouth the Usuri divides into two branches, the one flowing into the Amoor at the port of Kahebrafka, and the other taking a more westerly direction, and also empties into the Amoor. During the last three days of my journey on the Usuri the thermometer, at 8 A. M., ranged to 32° Fahr., and both the Imisick, or driver, and myself suffered from frozen ears, noses and hands. I arrived at Hebarofka (which is a place of 600 or 700 souls, and a winter station for the Amoor steamers), on the 23d of December.

The Usuri rises between 44° and 45° north, and has a length of 530 miles. It is navigable during the summer months by small steamers for 350 miles. Gold is found in the small streams flowing into it, and the Siberian government are pushing emigration to its banks; still, the long and severe winters will prevent any great agricultural development, though as a mining district it may rival the Amoor, or even the untold riches of Léra. It



is a curious fact that tigers are found in this cold country, and, before my arrival, one was killed near the house in which I lived, in the heart of the village of Hebarofka. Tigers have been traced as far north as  $51^{\circ}$ , and hardly a day passed that I did not see fresh tracks between Lake Hanka and the Amoor.

The Amoor at Hebarofka is about four miles wide, and from hence to the sea flows through a low, unproductive country, thinly populated by a few tribes of Ghilasks and Goldi.

My journey from Hebarofka was made over the frozen Amoor and the Shilka, and across the Baikal Lake to Irkutsk, where I arrived by the end of January, 1871. The distance is about 2,400 miles.

The section between Hebarofka and Irkutsk possesses much grand scenery and many interesting features, but it has already been ably described in works on the Amoor and Siberia, and I doubt if I can add any information of importance to those descriptions. That portion of Russian Mantchooria between Castres and Olga Bays is as yet untrodden by white men, and the inhabitants have long been regarded by the Manjoors as an unconquerable race of savages.

Mantchooria is the "out west" of China, and a large immigration is constantly arriving and settling in the fertile valley of the Sangashi. Numbers of horses and cattle are sent to the south, and considerable gold dust finds its way into China from the gold washings of the Shan-a-lin mountains.

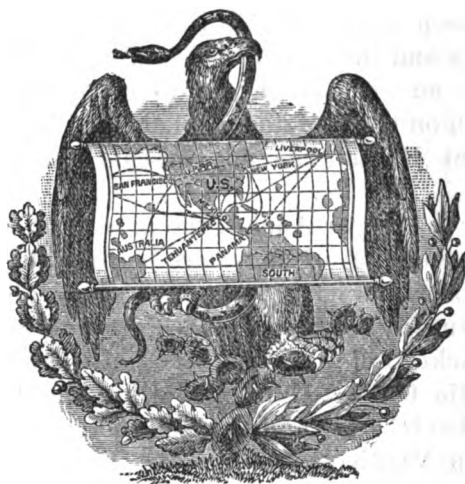
The Russian colonization of her territory is a system of forced military emigration; small colonies are placed every thirty or forty versts, without regard to the adaptation of the country, but rather to assure communication between the larger military posts. These colonies are in no case self-supporting, but are supplied by the government with flour and other rations; and they do but little for the general development of the country; neverthe-

less one cannot but admire that system which has planted a village every few versts, from Europe to the Pacific, through one of the most inhospitable countries on earth.

It has been supposed that the Russian occupation of Mantchuria and the Shaga-lin Islands was but a part of a systematic advance on Korea and Japan. From my observation on the spot and at St. Petersburg, I am convinced that Russia has no present designs on either country.

Holding the Upper Amoor, the possession of its mouth and free navigation of its waters became almost a necessity ; and a nation having so extensive a seaboard on the Pacific naturally required a safe port as a refuge for their fleets. Nickolskoi is comparatively useless, for the navigation of the Gulf of Tartary is tedious and dangerous, and only twelve feet can be carried across the bar of the Amoor ; in Vladivostok, however, Russia has found a commodious harbor within three days' sail of Shanghai, and with river communication to the very heart of her Siberian possessions.

In conclusion, Mr. President and ladies and gentlemen, allow me to express my thanks for the attention with which you have listened to my rather dry remarks, and to express the hope that, ere long, some daring traveler will lift the veil which hangs over the mysteries of Korea and Central Asia.



## X.

THE NEW ROUTE OF COMMERCE BY THE ISTHMUS  
OF TEHUANTEPEC.\*

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BY SIMON STEVENS.

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READ NOVEMBER 15TH, 1870.

MR. PRESIDENT, LADIES AND GENTLEMEN : The history of the lines of commerce is the history of the world. The paths of trade, radiating from the centers of wealth and civilization, are and always have been the channels through which the mental and moral wealth of nations has been disseminated.

\* Since the above paper was read, the following additional interesting reports have been received :

*a* The Tehuantepec Railway and Ship Canal ; *b* the Tehuantepec Railway and Tributaries ; *c* Inter-oceanic Movements, which will be found at the close of this paper.

With the creation, deflection or interruption of main lines of traffic, cities, and even nations, have arisen from poverty and weakness to wealth and power, or from power and wealth have descended into obscurity and ruin.

It is to some of these lessons taught us by history that we now ask your attention.

The East, the old homestead of the human family, the richest and most populous portion of the earth, has ever been considered the fountain of commerce. Its trade has from time immemorial stimulated the West, and enriched those communities which have participated in it.

Europe is of yesterday, and America of to-day, but who shall count the wrinkles on the brow of Asia, or tell the wealth which her commerce has produced?

When we speak of the East, we mean India, China, Japan, and "the Isles of the Sea," with possibly a dreamy notion of Persia and Asia Minor. These, indeed, are the commercial Asia of to-day, but we have reason to believe that other empires as mighty, as busy with trade, and as brilliant as these, with great cities and productive provinces, have faded from sight. Those in Central and Western Asia were destroyed, not so much by conquering Attilas and Tamerlanes as by the interruption or changes of ancient lines of traffic. Peking and Yeddo remain in the distant East, but where are Babylon, Nineveh, Tyre, Cairo, Thebes, and the countless cities whose ruins only remain as witnesses of their former existence?

If we may credit history, the mighty hand of war was laid upon them again and again, but the day of their final desolation did not come until the caravans of the East had found new depots and new lines of transit. Successive conquerors might lay waste Tyre, Sidon and Damascus; but so long as the trade between the East and the West required them, they were sure to rise again with startling rapidity. Arbitrary power and the keen political sagacity of Alexander of Macedon, as early as the fourth century before Christ, diverted the trade of his

Asiatic dominions through the Red Sea and the Nile to his newly-built city of Alexandria. The prosperity of that commercial emporium was so well established that to this day the dream of the Greek conqueror continues to be fulfilled.

In fact, it would be difficult to find a more complete illustration of the laws of trade to which we are directing attention than in the fluctuating fortunes of this Egyptian port, which seems now to have received a new impetus from the reopening of the Suez Canal, which seems likely to restore to it much of its earlier prosperity.

The peculiar character of the commerce of the ancients and the character of the goods transported, at least for long distances, made it possible to conduct it, for the most part, by overland routes, while the sea was comparatively neglected. It is indeed probable that the canal, between the Red Sea and the Mediterranean, as it was originally planned under the Pharaohs, was but an effort to restore artificially a channel which nature herself had provided in an earlier period of the world. Whether or not the Phœnicians under Pharaoh Necho, or the later Greeks, effected the circumnavigation of Africa, there was nothing in the ordinary commerce of that day to call for or employ such a prolonged and perilous route; so, therefore, traffic adhered to its caravans and short voyages. It will be gathered from this how very considerable must have been the commerce of those days between the countries bordering the Mediterranean and Eastern Asia, including the isles of the sea, to cause so many vast cities to spring up in the desert and flourish by the tariffs and tolls of a carrying trade.

At the beginning of the Christian era, all that was then known of Europe, Africa and Western Asia was ruled by or was tributary to the Roman Empire. The subsequent growth of Christianity seemed to be, in a manner, circumscribed by its eastern limits. Centuries later, the Greek Emperors of Byzantium managed to revive and keep

open the routes of Asiatic commerce, even after the fall of the Western Empire, chiefly because of the decadence of the commercial cities of Egypt. The successive struggles and rebellions which desolated Asia Minor were but the efforts of mighty robbers to acquire the right and the power to levy tribute on the trade between the East and the West.

In the seventh century a power began to make itself felt in the earth, which, in at least its earlier career, was less a robber than a destroyer. Its success operated not so much to transfer the ancient lines of commerce to new hands, as to monopolize them altogether. The followers of Mahomet cared less for trade than power, their aim being to establish the Koran by the sword. One by one the Christian States and cities of Western Asia and Northern Africa went down before the Moslems, and wherever their authority was extended all traffic with the Christian world to the westward was transferred to their keeping, so that though goods passed with heavy tribute, all news from whence they came was cut off.

A description of the position of the commercial world about the time of the culmination of the Moslem power on its western borders, less than four hundred years ago, has been clearly stated by a recent writer substantially in the following words :

According to Ptolemy, the best recognized authority, whose geography had stood the test of 1,300 years, the then known world was a strip of some seventy degrees wide, mostly north of the equator, with Cadiz on the west, and farthest India, or Cathay, on the east, lying between the frozen and the burning zones, both supposed to be impassable by man. The inhabitants, so far as known in Europe, were Christians and Mohammedans, the one sect about half the age of the other. Christendom, the elder, that once held considerable portions of Asia and Africa, had been driven back inch by inch in spite of the Crusades, even from the Holy Land, the place of its birth, up

into the north-west corner of Europe ; and, both in lands and people, was outnumbered six to one by the followers of Mahomet. For seven hundred years the fairest provinces of Spain acknowledged the sway of the Moors ; and the Mediterranean, from Jaffa to the Gates of Hercules, was under their control. The Crescent was constantly encroaching on the Cross, while Christendom, schismatic, dismayed, demoralized and disheartened, seemed almost incapable of further resistance.

The several routes of commerce to Asia beyond the Ganges, via Venice and Genoa, by the Red, Black and Caspian Seas, through Persia and Tartary, were one by one closed to Christians.

The profits of the overland carrying trade, what there was left of it, were mostly in the hands of the Arabians ; but Memphis, Thebes and Cairo, which had once flourished by that trade, had declined as it fell off in amount, and yielded its poor remains to Alexandria, nearer the sea. Finally, in 1453, Constantinople, the Christian city of Constantine, fell into the hands of the Turks, and with it the commerce of the Black Sea and the Bosphorus, the last of the old trading routes from the East to the West.

So far as Europe was concerned, Asia had almost disappeared from the commercial world. From that time forward the almost incessant wars between the followers of the Crescent and the wearers of the Cross rendered anything like commerce to the last degree precarious and unsatisfactory, while the narrow and blinded policy of the Mohammedan potentates almost prevented them from employing, even for their own benefit, the splendid prizes which they had won. Comparatively small as was the trade thus permitted, and hampered as it was by perils, losses and enormous cost, it was still sufficient to maintain for ages the splendors of Stamboul, and to continue for years the prosperity of Venice, Genoa and other Italian trading towns. This trade, though Asiatic, was but to a small extent Oriental, in

the true sense of the word. Though the silk and rich manufactures of China and Japan, and the "spices" of the Moluccas found their way to the remotest parts of the West, even to fair Albion, yet the consumers cared little to inquire whence they came beyond Venice or Genoa; for all beyond was shrouded in mystery.

Through all the darkness of the middle ages there were left some studious inquirers into the history of the past, and some sagacious prophets of the future, who were by no means ignorant of the great commercial causes which had from time to time built up and destroyed the old trading stations. Hence, the fall of Constantinople to the Christians of the West, especially those of Portugal and Spain, was but the signal of renewed energy to reopen the old paths of trade, or seek out new ones in order to secure direct participation in the fabled riches of the East.

The Spanish queen, whose steady heroism and religious enthusiasm sustained Spain in her long struggle against the Moors, was the same Isabella, who, as soon as she could take her breath after the fall of Grenada, in 1492, sent for Columbus, her old suitor, almost as exhausted as were her own royal coffers, and said to him, "Now, sir, we will attend to you," offering to pledge her private jewels for his outfit.

Columbus was more than successful, and thus the same memorable year that gave to Mohamedanism its first check in Europe, gave to Christendom a new world. There were many men at the battle of Lepanto who afterwards distinguished themselves as American discoverers and explorers.

The blind wrath of Moslem bigotry, and the oppressive exactions of Moorish avarice, operating as we have seen to close the old gateways of the East, were destined thus indirectly to promote the accomplishment of results whose magnitude it is difficult to comprehend. Truly the ways of God are past finding out. How often He rewards earnest discoverers with inventions they sought not! The



Almighty who permitted the False Prophet to scourge a corrupt and debased Christendom, also permitted the nations who had fled before the Crescent to find a new world while searching for the fabled East of the old.

The van of the new era of discovery seems to have been led by Portugal, whose peculiar position in the south-west corner of Europe, with the boldly projecting coast of Africa trending away south-westerly below her, must naturally have suggested the direction which her exploration should take. As early as 1454, the captains of Prince Henry of Portugal, surnamed "the Navigator," began this work in earnest, and by 1463 they had pushed their discoveries as far as Sierra Leone. That year, Gibraltar was captured by the Spaniards, and Prince Henry died. King Alphonso and King John pressed forward the work, so that by the year 1487, after nearly seventy years blindly groping down the coast of Africa, Bartholomew Diaz had pushed southward through the tropics so far as the Cape of Good Hope, thus bursting forever the barrier of ignorance and fear which had sealed the southern gateway of the Indian Ocean. Still it was another ten years before Vasco de Gama rounded that stormy cape and found his way to Calicut. The fact that this glorious event occurred just five years after Columbus had successfully balanced his egg, it must be confessed somewhat dimmed the splendor of its novelty.

A triumph truly these two routes to the East, and the beginning of a new era in commercial history; but Christians were only a short step in advance of their Moslem foes. The policy of Portugal and Spain was narrow and restrictive. What each discovered she strove jealously to guard for herself. The new Portuguese route to Asia was meant to be as confirmed a monopoly as were the old paths in the iron gripe of the Commanders of the Faithful. Spain was not more liberal.

But a new order of things was rapidly approaching. In 1453, when the Moslems captured Constantinople, and

finally closed the trade of Asia to the merchants of Christendom, Columbus was a lad of six years at Genoa, Vespucci of two years at Florence, and John Cabot a youth at Genoa; but to these three Italian boys the world was yet to owe an immeasurable debt. While they were growing up in years of wisdom, the nations which were to employ them were also growing. While Columbus was slowly developing his convictions of the true shape of the earth and the true route to the Indias, Spain was grappling with the Moors in the closing scenes of that war of centuries, from which she emerged so gloriously. As victory enhanced the pride and ambition of the rising nation, the achievements of the neighboring kingdom were looked upon with more and more of envious emulation, until at last, after long and wearisome waiting, Columbus obtained the scanty means wherewith to promote this rivalry of Portugal. The Pope, a native of Spain, wishing to reward his former sovereigns for their persistent struggle against the Moors, forgetting the promises of his predecessors to the kings of Portugal, and not remembering that there were other Christians outside the Peninsula endued with Christian greed and enterprise, divided the world between them, after the manner of a more ancient potentate, and fortified this monopoly by the boldest of papal Bulls.

You and I, standing where we do to-day, on the land which Columbus discovered, have by no means yet comprehended the full measure of his success, nor can we ever approximate to such a comprehension unless we place ourselves in the mental position of Columbus, and adopt as our own his dreams.

From first to last Columbus never so much as thought of discovering a New World. He did but plan a new route, whereby Europe might once more enjoy the wealth-giving commerce of Asia beyond the Ganges, and he died in the belief that he had indeed accomplished his purpose. For more than twenty years after his first tri-

umphant voyage the Christian world shared in the belief of the great navigator. Henry VII granted a license to the Cabots to open a north-west passage, and when they discovered Newfoundland and other islands, they took possession of them as outlying islands of China or Japan. The Anglo-Saxon race has not ceased to hunt for that north-west passage.

When, in 1498, Columbus touched the shores of Venezuela he understood that the natives called the land "Paria," and he reasoned himself into the belief that this was the Paradise from which our first parents were driven. He and everybody else believed that these new lands and islands were in Eastern Asia.

So thoroughly had the one idea taken possession of the minds of men that, for a century more, the coast of the Western Continent was explored by the adventurers of all nations, less for the riches itself might contain, than for that invaluable strait which should penetrate the mighty barrier and allow the trade of Europe to sail on westward to the golden land of commerce. We who assume the same controlling conception, as our peculiar legacy from our adventurous ancestors, will not be long in finding that it is of greater significance and brighter promise to us than it could be to the merchants of any European metropolis.

In 1513, Balboa first looked out from the mountains of Panama upon the waters of the Pacific, and in 1519 Magellan sailed through the perilous straits which still bear his name, but it was a century later (1619) before they rounded Cape Horn, in their passage onward to the true Spice Islands and the real Orient. Meanwhile the persistent and daring pursuit of this geographical *ignis fatuus* of a natural strait led to a more thorough and practical acquaintance with North and South America than would otherwise, probably, have been obtained. Every bay and inlet was explored. The St. Lawrence, the Hudson, Delaware, Chesapeake, Mississippi, Coaza-

coalcos, Atrato, Amazon, Rio de la Plata, and other rivers were ascended with varied experience of suffering and adventure. Science profited greatly and the maps grew and multiplied, but each consecutive effort to penetrate the American Continent resulted in failure. It is true that Cortez conceived the idea of a ship canal from sea to sea at Tehuantepec, but the world was not yet ripe for it.

For three centuries and a half the commerce of Europe with Asia beyond the Ganges has toiled around the Cape of Good Hope. The well-won prestige of Portugal was wrested from her by the Dutch, French and English, who became involved in a protracted and varying struggle which eventuated in the all but undisputed predominance of Great Britain in the commerce of the East. Lisbon rose to commercial importance only to sink again, while Antwerp, Amsterdam, Liverpool and London attained their wealth by the management of a trade which at once reminds us of Tyre and the cities of Western Asia and Egypt.

From the very first, Spain assumed no share in the use of the African route; for, in 1493, within three months from the return of Columbus, Alexander VI, a Spaniard, a pope of not a year's standing, wishing to reward Ferdinand and Isabella for their struggles in expelling the Moors, divided our globe into two parts, by an imaginary line of demarcation passing from pole to pole, one hundred leagues west of the Azores and Cape Verd Islands, giving to Spain all she could discover within 180° to the west of it, leaving to Portugal all her African discoveries and the Indies for 180° east of it. After much dispute it was finally settled that the line should stand at three hundred and seventy leagues west of the Azores. Hence, it will be seen how Portugal came to possess and settle the eastern part of Brazil, and why Spain confined her operations to countries west of the Line, and made no

attempt to interfere with Portugal's African route or possessions.

It is now over three centuries and a half since the way around the Cape of Good Hope was discovered, and during all that time the trade of Europe with Central and Eastern Asia has steadily increased in volume and value. Every effort has been made to shorten the long voyages and add to their security; but, until these later years, the domains of the Sultan have presented the same impassable barriers that they did when Vasco de Gama made his voyage round Africa to India, while behind them lies what we may call the "dead lands" of Arabia, Persia, Afghanistan, Beluchistan and Turkestan, now receiving the fostering attention of Russia.

Not only was the trade increasing, but vital changes were slowly taking place, especially within the present century, and the Asiatic question is not now what it was three hundred years ago.

English enterprise has secured to itself a vast Eastern empire, including the richest provinces of Central and Peninsular India. In Australia and the adjacent islands, a new Anglo-Saxon Commonwealth, more easterly than Cathay itself, is a new commerce springing up of vast extent. The lines of commerce are straight lines, seeking the shortest, quickest and cheapest transits possible; hence, San Francisco and Tehuantepec must eventually become the Tyre and the Alexandria of our age. America has indeed broken down the ancient barriers of the oldest empires of the world, and our future commerce with India, China and Japan bids fair to become extensive.

The great minds which direct the mercantile interests of Europe have never for a moment been blind to the dazzling future. The great commercial powers have been steadily aiming to grasp the prize. Russia has been pushing her conquests in the East up to the Chinese frontier, building long lines of railway stretching eastward, while year by year her trading fleets are increasing upon the

**Black Sea and the Caspian.** England has increased her ocean steam services, shortened her lines of transit, built swifter vessels, and multiplied her Indian railways; while France, with a bolder and deeper insight into the future needs of trade, has been negotiating and toiling for the resurrection of one of the most ancient routes of commerce, the canal (once perhaps a natural strait) across the narrow neck of land which connects Asia with Africa, and separates the Red Sea from the Mediterranean. Diminished as is the value of the Suez route by the difficult navigation of the Red Sea, the drifting sands of the desert, and the gentle and variable winds of the Mediterranean, there can be little doubt that, so far as Europe is concerned, her trade with the East has entered upon a new era, which will probably ere long work considerable change in the relative positions of the commercial powers. One at least of the paths which were shut by the Moslem conquerors has been reopened to the trade of the world, and it is morally certain that others will follow in due time.

The toiling caravans are to be replaced by the rail and the steam-engine, while swift propellers will penetrate the African Isthmus instead of the clumsy barges of the Egyptians, or the triremes of the Ptolemies, the Romans and the Caliphs; but only the methods of transit will be changed, for there will in all this be nothing new under the sun. Even if the railway and the telegraph call into life new empires and fresh marts of trade on the sites of the old Babylons, Ninevehs and Palmyras, all will but go to confirm the primeval law of human commerce, that "the trade of Asia is the wealth of nations."

We in America, heirs of the dream of Columbus, have not only our peculiar interest in all this; we have a plain but most important lesson to learn, and we shall do well by ourselves if we learn it promptly.

When the failure of all efforts to penetrate the American continent seemed to forever compel the commerce of

Europe to reach Eastern Asia by the African route, the peculiar relations of the American continent to the commercial geography of the world seemed to have been altogether lost sight of. Not a hundred years ago, a learned society of France seriously debated the question whether, on the whole, the discovery of America had been of advantage to the world—that is, probably, to France. But now, even though the nations of western Europe have found in the fast-expanding trade of America still another “Orient” from which to drain wealth for their capacious coffers, they seem to have utterly ignored or failed to comprehend the fact that America is, after all, not only a part of the world, but rapidly becoming the acknowledged central continent of it, and must hereafter hold the keys of commerce.

All these years, however, the New World has been steadily growing in population, wealth and a correct understanding of its own interests, until now. At the end of these three and a half centuries, during which Europe has overlooked us, there has been developed here a commercial power overshadowing both coasts of the continent, and fully competent to take into its own control the guidance of the commercial future of this hemisphere.

The United States of America are deeply interested in all movements aimed at the creation of new or the deflection of ancient lines of traffic between Western Europe and Eastern Asia.

Let me here call your attention to a few considerations, drawn from the physical structure of the two continents of North and South America. Some facts are open to the most superficial observer. It is evident that North America is not only very much the larger, but that it lies wholly within that northern hemisphere which contains the population, the history and the commerce of the globe. It lies, moreover, almost altogether to the westward of South America. The meridian of Washington

almost escapes the western coast of South America, while the meridian of Cape Horn passes to the eastward of the United States altogether. Tehuantepec is near the longitude of Omaha. A ship bound from New York to San Francisco is compelled, in rounding Brazil and doubling Cape Horn, to sail further eastward than the entire direct distance between the two cities.

Do not suppose for a moment that South America, with her undeveloped wealth, is to have no share in the western commercial system. Her position is such as to vastly increase her commercial value and intimate connection with both coasts of North America, so soon as our own nation shall have provided ample interoceanic communication. At present the countries of three-fourths of the South American coast are nearer, by steam or sail, to the ports of Europe than to the Atlantic harbors of the United States; nor are our Pacific ports better situated in this respect.

When the slow and arduous task of ascertaining the true nature of the geography of the Americas was accomplished, and the fact was unwillingly accepted that nature had left no break in the rugged barrier which extended from the frozen sea of the north to the Straits of Magellan, and even sooner, the quick and fertile brains of the early navigators grasped the conclusion that what nature had omitted must be supplied by the ingenuity and courage of man.

The thought was promptly supplemented by deeds of exploration so daring, so judicious and so exhaustive, that, if the records of their observations, now at Madrid, should at this day be examined, we should require but little additional information on the American Canal question. What Spain already knew of the continental nature of the regions which widened away to the north and south, though vague and faulty, was sufficient to restrict her surveys to the irregular reach of narrow land



which extends between Tehuantepec and Darien for more than seventeen hundred miles.

At many different points in this isthmian extent, enthusiastic explorers were positive of discovering an eligible point for the construction of transits from sea to sea, by ship canal or otherwise. Even then, the names of the Tehuantepec, Honduras, Nicaragua, Panama, Darien and Atrato routes were as familiar in the mouths of men as they are to-day.

There was then but one question to answer, and one problem to solve: "What is best for Spain? and by which of these routes, if more than one is practicable, can Spain best carry on her commerce with the Indies?" The requirements of an American commercial system were not thought of.

So far as American interests are concerned, Europe of to-day is as regardless of them almost as were the Spanish explorers.

The reason of this neglect is obvious, when we consider that hitherto a route for a canal has been sought by or through Europeans, and the merits of each locality have been considered only with reference to European commercial interests, and the employment of their own capital. This, too, has permitted a species of political blindness, preventing them discerning that that route only, which was best for the trade which needed it most, could be the most advantageous for all.

Let us once more turn to the map of North America.

At the centre of its southern projection, almost landlocked by the coasts of Cuba, Florida, Yucatan and the mainland, the Gulf of Mexico, the Mediterranean of America, is situate precisely where it can best answer the demands of American commerce.

The great interior river navigation of North America has its outlet through the Mississippi into the Gulf of Mexico; while a region larger and richer than all Europe, west of the Adriatic, is drained into its circling coast line. It is

impossible to over-estimate the importance of this inland sea, and it would be something akin to insanity to dismiss it from consideration in connection with such a subject as the development of the American system of trade.

Let us draw a line north and south as nearly as possible through the centre of North America. We find that it cuts the southern terminus of the Gulf of Mexico a little west of the peninsula of Yucatan, and at about the narrowest portion of the isthmus, which is on the meridian of the western border of the State of Missouri.

Here, and here only, can the trade of the Gulf of Mexico, and our swarming interior, together with that of the Atlantic and Pacific, as well as that of Asia and of Europe, be fully accommodated. If it be possible to construct at this point a railway and an available ship canal, nothing but the discovery of something approaching to a natural strait should carry us further to the southward, beyond Yucatan, or through the dangerous navigation of the Caribbean Sea. It should be borne in mind that the Isthmus of Tehuantepec is in latitude  $18^{\circ}$ , while that of Darien is but little more than  $8^{\circ}$ .

Nor should we for one moment lose sight of the solid truth that common carriers exist for the sake of trade, not trade for the sake of common carriers, and the end must in no case be sacrificed to the means.

In the determination of a question which involves interests of such magnitude as those which are now under discussion, no local jealousies, no minor considerations of individual profit or loss, can be entertained. Nothing less dignified than the development of a continent or the aggrandizement of a nation is entitled to a hearing. America will listen first of all to the United States, believing, at the same time, that the prosperity of the other political powers as well as all Europe is bound up in her own.

In peace, which may be regarded as the normal condition of our American national sisterhood, a ship canal

across the Isthmus of Tehuantepec would bring the Gulf ports nearer the harbor of San Francisco, by more than 2,500 miles, than would a similar work in connection with the Atrato at Darien. A similar advantage would be attained, in varied proportions, governed by respective localities, for the Atlantic ports of the United States and the commercial cities of western Europe. This continues true, in a greater or less degree, whether we compare the Tehuantepec with Darien, Nicaragua, Honduras, or any other proposed line of interoceanic transit. The trade lines from either coast of South America with either coast of North America, and of the entire west coast of our double continent with Europe, can be made to converge more advantageously at this point than any other. Nowhere else can all that vast preponderance of the Asiatic trade, which is compelled by Pacific calms, currents and trade winds to follow what is called the northern passage, accomplish such a saving, either in absolute distance or in the specific facilities of ocean navigation. The apparent gain which is presented by a superficial examination of the map is very largely augmented when we take into account those tropical calms and other phenomena which mark the eccentric ocean that separates us from China and Japan. If these truths are of such importance in their general application, so much the more do they become intensified when we consider them with reference to that incalculable commerce which, in that event, would converge toward and radiate from the shores of the Gulf of Mexico. No more vivifying stimulus could be given to the swift development of our southern tier of States; no greater boon could be conferred upon the valley of the Mississippi than a direct connection by water with our Pacific coast and Asia, nor, in these days of costly steamships, should any needless day or mile be added to the time or distance of their passage.

At the same time, selfishness itself forces upon us, as a not unimportant consideration, that no stronger stimulus

to her commercial system, no better guarantee of future prosperity, could be provided for our sister republic. The statesmen of Mexico have learned to look upon the Tehuantepec ship canal as one of the bright stars of hope in their national future.

It has been said that the history of the Suez Canal, extending back as it does to the time of the Pharaohs, Ptolemies, Roman Emperors and Moslem Caliphs, is a mine of archæological romance; but if that is true of the Egyptian transit, it may be repeated with *ténfold* verity concerning the central lands of America. Geological observers assure us that the very summit of the Isthmus of Tehuantepec is of coral formation. The rocks that tower above these deeply cut and winding passes, were once low islets, or submerged beneath the bosom of the western sea, and at their sunken bases the monsters of the deep played in and out where we propose to construct our artificial channel. Speculation loses itself at once in any attempt to imagine the precise configuration of this part of the continent at that early date, or the nature of the convulsions by which it was changed. We can hardly guess if the mouth of the Mississippi was not then hundreds of miles further to the north, on the margin of a great inland sea, whose outlet may have been at Tehuantepec, and into the western ocean instead of the Atlantic.

The recent researches of the Abbé Brasseur de Bourbourg have removed some points of Central American archæology from the realm of conjecture, and placed them among the established facts of science. Not only the Tehuantepec cliffs, but the mountains of the Atlantic coast range are of coral formation. The most wonderful of our observations, it may be, and the most interesting to Biblical scholars, is yet to come. Who will hereafter sneer at Noah's flood, when he learns that the mighty ruins of Yucatan point so distinctly to precisely such a general submergence? These ruins, rivaling in interest,

though perhaps not in extent, those of Egypt, are covered with hieroglyphical representations, evidencing a high degree of architectural and engineering skill. What, indeed, shall we say, except that the real history of the globe in which we live mocks at that which has been written, and laughs at the feeble light of what we are pleased to call "science." Well may archæologists ask, which is the *old* world?

Even so imperfect an allusion to the topography of the isthmus leads us to observations tending to correct a somewhat popular fallacy concerning the Tehuantepec route. While much of it lies through a virgin wilderness, and will encounter the obstacles appertaining thereunto, that very wilderness is itself a mine of wealth. Nowhere on the globe is there a healthier or more equable climate, in spite of its intertropical locality. Nowhere are there such boundless supplies of the most valuable woods known to the arts and mechanical necessities. Pine, oak, mahogany, logwood, lignum-vitæ, ebony and other valuable varieties of trees, are supplemented by the rubber tree, medicinal plants, dye-stuffs, and a soil which produces, in profuse abundance, coffee, indigo, cacao, tobacco, Sisal hemp, bananas, oranges and endless tropical fruits. A large portion of this region was under luxuriant cultivation by the hands of white men, while yet the spot whereon we stand was an unbroken wilderness. Here, on the banks of the Tehuantepec, Cortez selected his own estates as being the very garden of Mexico, and the surest fortune for his descendants. Nor was he at all in error. To this day his broad lands are held by those who call him their direct ancestor, while even Republicanism calls his estates "the Marquisanas." Back among the hills and mountains lie towns and villages, with churches that date back over three centuries, while hidden in the primeval forests are the majestic ruins of a yet more ancient civilization, older than the

Spanish Conquest, older than the Aztec monarchy, older perhaps than Karnak or Thebes.

I have dwelt upon this feature of the isthmus country to better develop an important desideratum which cannot be so well supplied by any of the other routes proposed, to wit, the sure development of local population, wealth, trade and agriculture upon these lines of interoceanic transit. Not alone would such a development create a local protectorate and guardian of the great work itself, but would rapidly provide sufficient resources of supplies, repairs and other benefits to passing navigation, which could only be secured at great expense and continual uncertainty in localities less favored or more remote.

This region has at present no outlet—no regular communication with the outside world. Give it these. Give the people education, with toleration in religion, and you establish at once all the conditions of life, growth and power.

Such, briefly, are some of the ascertained advantages of the Tehuantepec route in time of peace, and the most thorough and searching examination will but make them more strikingly manifest.

The history of the world compels us to assume war as one of the sure prophecies of all national future, and that misfortune will occur to some one or other of the commercial powers interested in the American interoceanic transit as certainly as the sun rises and sets. Let us hope that our own beloved land may not be involved, but only fatuity could allow us to lose sight of even that sad possibility.

In the event of war among any of the maritime powers, it will be of the first importance to all the rest that so necessary a commercial highway should be kept sacred to the interests of peace, and not become, in the hands of weak or interested States, an object of warlike ambition or a scene of military operations.

Neither of these great ends could be assured should the proposed canal be located to the southward of the peninsula of Yucatan.

On the other hand, the land-locked character of the Gulf of Mexico, and the narrow and difficult navigation of its outlets on either side of the Island of Cuba, would make this nation, conjointly with Mexico, the guardian and guarantor of a canal which opened upon the Gulf; and it would be difficult to over-estimate this advantage. We could not even approach a due conception of its importance without lifting the veil from our national future and peering prophetically in among the eventful centuries yet to come.

In war, then, as in peace, the necessities of our commercial developments, the self-evident economies of trade, the dictates at once of broad statesmanship and prudent patriotism, point unmistakably to the Isthmus of Tehuantepec as the best of all localities for the construction of our interoceanic ship canal.

We have assumed, what we fully believe to be true, that a canal at Tehuantepec would be of more value to the United States and to the world than a similar canal at any other point to the south of it, and explorations have demonstrated the fact that at no point is it possible to make a through-cut from sea to sea. Such would be a preposterous undertaking in the way of mammoth cuts and tunnels, and would carry both cost and engineering into a region of dreamy and fanciful extravagance.

The Tehuantepec project, on the other hand, only presents difficulties precisely similar to those which have already been overcome with ease in other ship-canal undertakings in various parts of the world.

**TRANS-CONTINENTAL, ISTHMIAN AND OCEANIC ROUTES OF COMMERCE.**

**NEW YORK TO SAN FRANCISCO.**  
Via Union Pacific R. R. 3,361 miles.

**NEW YORK TO YOKOHAMA.**  
Via Tehuantepec..... 9,435 miles.  
Via Suez..... 13,493 "

**LIVERPOOL TO YOKOHAMA.**  
Via Suez..... 11,403 miles.  
Via Tehuantepec..... 12,900 "

**NEW ORLEANS TO SAN FRANCISCO.**  
Via Union Pacific R. R. 3,065 miles.

**LIVERPOOL TO SAN FRANCISCO.**  
Via Tehuantepec..... 7,614 miles.  
Via Panama..... 8,407 "

**Other routes shown:**  
Cape Horn..... 16,380 "  
Cape of Good Hope..... 16,710 "

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## APPENDIX.

## REPORT.

## (a) THE TEHUANTEPEC RAILWAY AND SHIP CANAL.

LONDON, October 16th, 1871.

SIMON STEVENS, Esq.,

*President of the Tehuantepec Railway Company, New York :*

SIR.—The undersigned, appointed by you a commission to examine some of the principal artificial waterways in Europe, with a view of applying the best and most recent experience to the project for an interoceanic railway and ship canal across the Isthmus of Tehuantepec, Mexico, respectfully report, that a portion of our number have examined personally the Caledonian canal, the great Dutch ship canal now under construction for the purpose of establishing an easy and direct communication between the port of Amsterdam and the German Ocean, and also the less known, though very interesting, work now in progress at the Hook of Holland, viz., the new waterway from Rotterdam to the sea ("Waterweg van Rotterdam naar Zee").

The members of the commission have been courteously furnished with every facility for the examination of these interesting works. The Lord Advocate of Scotland, one of Her Britannic Majesty's commissioners of the Caledonian canal, kindly furnished us with letters to the officers in charge of the canal; the superintendent of which, Mr. Davidson, accompanied us, and explained the more interesting parts of the works. To the eminent engineer, Mr. Hawkshaw, and to his associate at Amsterdam, Mr. J. Dirks, we are indebted for the fullest information, together with plans of the Amsterdam ship canal, one of the most remarkable works of engineering of the present day. Mr. Dirks personally accompanied us in our examinations. To Mr. Caland, the chief engineer, and a member of the "Waterstaat" of Holland, we are

also indebted for the opportunity of making ourselves personally acquainted with the work at the Hook of Holland, as well as for documents and valuable information.

Want of time (owing to duties or engagements) has prevented personal visits to other great waterways, especially the Suez and Languedoc canals, which would be instructive in reference to a project for any new ship canal; but these works are so thoroughly described, their characteristics and details so well known, as to enable us to dispense with personal examinations. The various surveys and projects for ship canals at sundry points across the American Isthmus are, of course, familiar to, and have been attentively examined by us.

A brief memoir of the history of the railway and canal project for the Isthmus of Tehuantepec will be in place here. This isthmus has always, since the early days of American discovery, attracted attention and explorations, as one of the most available points for interoceanic communication; but the project for a "ship canal" first assumed a definite form in the report\* by Senor Moro, founded on a survey made in 1842.

This survey originated in the concession by the Mexican government to Don Jose de Garay of the right to open a communication between the Pacific and Atlantic Oceans, through the Isthmus of Tehuantepec, coupled with the condition that the grantee "shall cause to be made at his own expense a survey of the ground and direction which the route should follow, and also of the ports which may be deemed most proper and commodious from their proximity."

Although the communication to be established was not necessarily to be a ship canal, or even (wholly) a water communication, yet it is evident that such a canal, or at least a great canal, was contemplated both by the Mexican government and the grantee; and the engineer, Moro, expressly states that to such a communication his attention was chiefly directed in making his survey.

In fulfillment of the obligation to make a survey, Senor de Garay immediately dispatched to the Isthmus a scientific com-

\* "An Account of the Isthmus of Tehuantepec, with proposals for establishing a communication between the Atlantic and Pacific Oceans, based upon the surveys and reports of a scientific commission appointed by Don Jose de Garay. London, 1846."

mission, composed of Senor Gaetano Moro as chief, and Lieutenant-Colonel de Troupliniere and Captain Gonzales, of the staff corps, and Lieutenant Mauro Guido, of the navy, as assistants, and Don Pedro de Garay, an officer of the ministry of war, as secretary. The commission spent nine months upon the isthmus in the execution of its task. It fixed the position of the more remarkable points by astronomical observations or by triangulation, measured the most important altitudes by barometric or trigonometric observations, and explored in a general way the more important water-courses and harbors; and furnished, so far as it went, a tolerably accurate account of the isthmus in its geographical and topographical relations to the question of a canal, and gave very valuable information concerning the mineral wealth and the natural and agricultural productions.

Senor Moro based upon this survey a project for a canal of twenty feet in depth and fifty miles in length, connecting the upper waters of the Coazacoalcos, on the Gulf side, with the lagoons of the Pacific coast. The summit was at Tarifa, at about 680 feet above the level of the sea.

Further than to make the survey mentioned, nothing was accomplished by Senor de Garay with regard to executing the canal. After the acquisition of California by the United States, this route acquired a new importance as a means of communication with our newly acquired Pacific territory. Could possession have been obtained at once, Tehuantepec would probably have become the established route of communication, owing to the great saving of distance over Panama, as well as the salubrity of the climate.

Soon after the close of the war between Mexico and the United States, the franchises and privileges of Senor de Garay became the property of Mr. P. A. Hargous, of New York, who, in connection with a company formed in New Orleans, assumed the rights and responsibilities of the Garay grant. But the necessary negotiations with the Mexican government, and with other parties interested, delayed a commencement of operations till December, 1850, at which time the company, having applied to President Taylor for an officer of engineers to direct the survey, Brevet-Major J. G. Barnard, captain of engineers, was detailed for that purpose. The aspect of the problem was at this period

peculiar, the great object being to establish, at the earliest possible day, an available route for the great flood of travel between our Atlantic and Pacific coasts. Hence, the idea of a canal was put aside, and that of a railroad substituted. The survey then ordered was therefore organized and executed solely in reference to a railway and a preliminary and auxiliary wagon road, and these it was urgent to establish with the least possible delay. These facts not only shaped the whole character of the survey, but they even altered the route. It was necessary to extend these roads at once to the Pacific (instead of striking the lagoons, as the canal would do); and the "Ventosa," or "Salina Cruz," were the most available points for the Pacific terminus.

Instead of passing over Moro's summit (Tarifa), the more westward passes of Chivela and Masahua were surveyed. Hence the survey under Major Barnard not only did not coincide with Senor Moro's at the summit, but the entire route between the seas was quite different from that which a canal would occupy. The survey thus executed may be said to have been commenced in the end of December, 1850, and substantially terminated early in the following June (1851). Its results are so fully set forth in the report of the survey, prepared by J. J. Williams, one of the undersigned, that we need only state that it established the practicability of a railway route at moderate expense, and with grades not exceeding sixty feet per mile, and with a summit about 800 feet above the level of the sea. The passes surveyed were not supposed to be as low as the more eastern one of Tarifa, and no observations whatever were made specially directed to the practicability of a canal.

In the year 1857 the railway project was resumed, and a new survey executed under the direction of W. H. Sidell, now lieutenant-colonel of infantry and brevet brigadier-general, U. S. army, a distinguished civil and railway engineer, the object being a final location of the road. This latter survey was made with much care and expense. Upon its results and the previous surveys the line of location has been definitely laid down, the cost of construction estimated, and everything established necessary to the issuing of specifications for contracts for the execution of the work.

Since the revival, under the impulse of the successful execution

of the Suez canal, of interoceanic canal projects, the claims of the Isthmus of Tehuantepec for favorable consideration have gradually acquired a pre-eminence which was at first denied. The virtual failure of all the recent explorations instituted by the United States government to find a practicable route where the isthmus is narrow — as at Panama and Darien — and the superior advantage of geographical position of Tehuantepec, its healthfulness, and its vast local resources for the construction of such a work, and its established practicability, in an engineering point of view, for a canal with locks, are now understood, and must have their weight.

In describing the different surveys that have been made, we have reserved mention of the most recent; and, in reference to the establishment of the “practicability” which we have claimed for the canal project, the most important. We allude to the survey made during the last winter and spring by Captain R. W. Shufeldt, of the United States navy, by order of the President of the United States, in pursuance of an act of Congress for that purpose, and with the co-operation of the Mexican government, for the special object of determining the question of an adequate water supply.

The final report had not been transmitted to the Navy Department at the date of our leaving the United States, but the authenticated copies of preliminary reports have been furnished you by the honorable secretary of the navy, and are given in full in the appendix of this report.

We have in them, from the highest source and in the most positive form, the important conclusion “that an interoceanic canal of any necessary dimensions may be constructed across the Isthmus of Tehuantepec.” We have also the further statement of the engineer, on whose exploration Captain Shufeldt bases his own dictum (just quoted), “that a ship canal across the Isthmus of Tehuantepec is not only practicable, but also that the topography of the country presents no extraordinary obstacles to its construction.”

The latter statement, that “the topography of the country presents no extraordinary obstacles to the construction of a canal,” is but a confirmation of the information obtained from Major Barnard’s, Mr. Sidell’s, and Senor Moro’s surveys. The

railway surveys and location, passing over a line nowhere actually coinciding with the probable line of location of a canal, does not of course furnish the means of exhibiting a profile of such a location ; but most of the country through which it would lie has been traversed by Major Barnard's, Mr. Sidell's, Mr. Williams' or Moro's parties. Moreover, it should be borne in mind, unlike the country over which explorations have been recently carried across the Darien Isthmus, through wildernesses entirely unknown to civilized man, of which a single line of survey will furnish but very meager information, the Isthmus of Tehuantepec has been a thoroughfare for centuries, while for the last thirty years surveying parties have been, at intervals, traversing it from shore to shore, either with instruments of precision in their hands, or subjecting it to scientific reconnoissances. With these preliminary remarks, we will proceed to define the probable line of location for a canal, commencing at the summit.

The summit determined in 1842 by Senor Moro was near Tarifa. This selection was confirmed by incidental examination during Major Barnard's and Mr. Sidell's surveys,\* and has now been once more confirmed by the survey of Captain Shufeldt. This summit level was barometrically determined by Senor Moro as being 680 feet (206 metres) above the level of the sea. The precise determinations of the elevation of the contiguous (railway) summits of Masahua and Chivela authorize the belief that the above statement of Moro is near the truth. The descent toward the Pacific plains (elevated at the foot of the mountains about 240 feet above the sea) would be either by the "Portillo

\*" As principal engineer of the commission under Major Barnard, while making explorations and a survey for a railroad across the isthmus in 1851, I took occasion to examine the dividing ridge over which Moro had made his surveys for a ship canal in 1842 ; and although I did not pass over the entire route as surveyed by Moro for a ship canal, still I was at Tarifa, the summit, and on the most difficult ground over which he proposed to construct it, and I think I am safe in pronouncing the route, as surveyed by him, the most practicable of any yet explored."—*Report of J. J. Williams, 1870.*

It is also worthy of remark, that in the report of Major Barnard's survey the "Rio del Corte" was indicated by the same engineer as a probable source of adequate water supply for the summit level of a ship canal. (See page 245 of his report.)

de Tarifa," or (penetrating the small "Cerro del Convento") by the valley of the Monetza to its junction with the Chicapa, and thence by the valley of the latter river. The latter route furnishes the greater development (say ten or fifteen miles) for reaching the plains. Either route is believed to offer no extraordinary difficulties, though doubtless this descent is the most formidable work of the project. No tunnel is necessary, and the difficulties will lie in locating the bed and locks of a great canal along a descending mountain pass, in which the necessary excavations must be mostly in rock.

From Tarifa to the Portillo or to the Cerro del Convento, the distance is about four miles, measured over a plain so level that in the rainy season it becomes inundated. To depress the summit below the level of this plain would require a deep cutting, extending several miles. Such a cutting, even to the depth of a hundred feet, in relation to the magnitude and importance of the work, of which it would form an inconsiderable part, would hardly be thought formidable; and the resulting advantage of reducing the number of locks, and placing the summit more conveniently in reference to its supply of water, may quite probably demand it.

We shall therefore assume that the canal summit is not over 800 feet above the sea. The descent to the plains at the foot of the mountains would therefore be about 360 feet, requiring thirty-six locks of ten feet lift. From the foot of the mountains the canal, descending through 240 feet with the natural slope of the plains, would reach the upper lagoon in a distance of about fourteen or fifteen miles.

The main source of water supply of the summit, as determined by the survey of Captain Shufeldt, will be from the upper waters of the Rio del Corte, at a point some twenty-five to thirty miles from Tarifa. The route of a feeder was carefully surveyed, with transit and level, by Mr. Fuertes, chief civil engineer under Captain Shufeldt, who found it entirely practicable. Mr. Fuertes finds the supply furnished by the Rio del Corte, and other available sources, at its lowest stage, to be 2,000 cubic feet per second, or 120,000 cubic feet per minute.

From the summit towards the Gulf of Mexico, the canal would follow the well-defined route of the valley of the Tarifa and



Chichihua rivers, to the junction of the latter with the Malatengo. Crossing the latter stream, it would strike the Coazacoalcos at Old Mal Paso, which river it would cross at that point.

The route from Tarifa to the Malatengo and Coazacoalcos is thus described by Señor Moro: "This part of the country is the most fertile and pleasant that it is possible to imagine. Shortly after leaving Tarifa, it is truly interesting to observe, mixed together, the spruce and fir tree of the cold climates, the oak of the more temperate, and the palm tree of the warm regions. Further on, these trees, as well as beautiful green meadows of vast extent, occur alternately with woods of a luxuriant tropical vegetation. Trees of precious woods, wild cacao, vanilla, etc., are everywhere seen. The plains near the rivers, cultivated by the inhabitants of El Barrio, Santa Maria Petapa and San Juan Guichicovi, give an idea of the astonishing fertility of the soil, since the natives only come in time to burn down the brushwood, and sow without cultivation, scarcely ever revisiting their corn-fields until the harvest time."

Various considerations caused the left bank of the Coazacoalcos to be preferred for the railway surveys; but there is no doubt that the proper location of the canal is on the right bank. A diminution of length by some forty miles, the avoidance of transverse ridges (easily surmounted by a railway), the fewer crossings of streams and the avoiding of the overflows, are all considerations uniting in its favor.

From the lagoons to the summit at Tarifa, and from that point to the crossing of the Coazacoalcos, the line is so well defined as to leave but the mere details to be determined. From that point the canal, to avoid the great Suchil bend of the river to the westward, would follow, as near as practicable, its chord, crossing the Chicolote and the Chalchijapa, and approaching the Coazacoalcos again near the source of the Coahuapa. This region is a dense forest. Observations taken from the summit of Mount Encantada authorize the belief that it is unbroken by any great topographical irregularities. The only considerable streams to be crossed (this statement applies to the whole route) are the Malatengo, the Coazacoalcos, the Chicolote and the Chalchijapa. The second named is by far the largest. The ordinary rise and fall is seventeen or eighteen feet; but in excep-

tional seasons it is stated to have risen higher. The point of proposed crossing has been selected on a thorough knowledge of its favorable character.

From the Coahuapa to the junction and termination in the Coazacoalcos river, the proposed route lies through a country nearly level.

The entire length of purely artificial canal thus approximately located will be from about 115 to 120 miles. The number of locks would be 120 in all, assuming a summit of 600 feet, a lift of ten feet, and also, as we have a right to do, that there will be no secondary summits.

We have now to speak of the harbors. The Coazacoalcos, for thirty miles from the Gulf of Mexico, forms an excellent harbor. Its access is over a bar having thirteen feet at low water (according to the recent survey of Captain Shufeldt).<sup>\*</sup> This bar is unchanging, and we anticipate no serious difficulties in attaining a navigable depth of twenty feet or upward. From the bar up to the point where the canal (as we have described its location) terminates, a distance of about thirty miles, the river is generally over twenty feet deep. At a few points there are but fifteen or sixteen feet depth. Of course, to adapt this portion of the river to a ship canal, will require channel improvements, and perhaps some rectifications in its course — no work, however, of great magnitude.

On the Pacific, the upper lagoon furnishes a basin in which, in the region occupied by the islands, and thence to the canal Santa Teresa, a depth of water of about twenty feet, with a mud and shingle bottom, is found.

To reach the ocean, one or both of the narrow peninsulas, which separate the lagoons from it, must be cut through, and an external harbor or entrance piers thrown out, similar to those now under construction at the North Sea terminus of the Amsterdam canal. The works at Suez, those at Amsterdam, and those of a very different character at the mouth of the Mass, yet having much in common with them, and that which we are now proposing, are sufficient proof that, to modern engineering, the

<sup>\*</sup> The survey of Lieut. Leigh, U. S. Navy, in 1848, gave twelve and a half feet at *extreme low water of spring tides*. There has probably been slight if any change.

establishing of a good entrance to these lagoons, for vessels of large draught, is quite practicable.

In the railway surveys, it was important to reach the best existing port on the Pacific. Ventosa was first selected. Neither this point nor Salina Cruz is considered eligible for the canal, owing to the advantages the lagoons offer for a capacious harbor, and the diminution in length of artificial canal and avoidance of river crossings, but it is interesting to know that there are already secure anchorages in the close vicinity of our proposed entrance to the canal.

The statements given in the appendix, show that the formation of an external harbor on the Pacific coast, which will afford entrance to the lagoons, is fraught with no probable difficulties, and that the coast is not a dangerous one, and that there now exist in the close vicinity safe anchorages.

It would be quite premature to attempt an estimate for the work we indicate. Surveys of the line can alone determine the data upon which one can be made. But we state with confidence that, for the length of the line and height of summit, it is rare to find a route so devoid of engineering difficulties. Moreover, the isthmus furnishes every variety of building material while from its population, and that of the States of Oaxaca and Vera Cruz, can be drawn, at no expense for transportation, a hardy laboring force quite adequate to execute the work. The soil of the isthmus and of the contiguous regions affords, in abundance, sustenance for such a force. The climate throughout is healthy, even to European laborers. With a native force sickness is not to be anticipated. Hence, some of the most formidable difficulties and sources of expenditure in the construction of interoceanic routes, at other more southern points of the American isthmus, are not encountered on the Isthmus of Tehuantepec. The cost of earth and rock excavation or masonry should not exceed, on the isthmus, the cost of similar works in Europe.

In this connection we express our hearty concurrence with the views of M. Thome de Gamond, in his "*Avant projet*," for the Nicaragua canal, projected by M. Felix Belly. M. De Gamond says: "We think that, after the example of the Dutch and the Americans, it is important to make extensive use of timber

instead of masonry. The San Juan river traverses a virgin forest, furnishing trees of great dimensions, both in diameter and height. These timbers belong to the 'Concession,' and can be employed in unlimited quantity, with no other expense than that of the carpenters' work. To overlook the value of these gratuitous resources, and to prefer masonry merely because masonry is more durable and more monumental, would be to increase expense for an empty satisfaction."

Again, he says, "It would be an error to think that we can, in this enterprise, copy works executed in Europe under the formal rules of construction there adhered to. It is necessary, above all things, for the accomplishment of such an enterprise, to lay under contribution the immense local resources of nature, and to utilize in the employment of these resources that which is most applicable in the distinctive genius of every nation."

All that is said above by M. de Gamond applies perfectly to Tehuantepec. The immense forests of the most valuable and durable timbers which lie along the route should furnish the material for locks, bridges and aqueducts, by which the expense of these otherwise most costly structures will be reduced to a fraction of that which masonry would require.

The use of timber in the United States for locks and aqueducts and bridges is so common that we need not refer to examples; to adopt its use at Tehuantepec is but to adopt the principle of M. de Gamond, and to apply the "distinctive genius" of American construction to an American work, and at the same time to "utilize" the immense constructive resources offered us in the forests of Tehuantepec.

In what precedes we have given no "dimensions" for the proposed canal. It would be premature in this report to do so. But it should be understood that we refer to a ship canal with an available depth of not less than twenty feet, and of locks of corresponding dimensions (say of 450 feet in length and fifty feet in breadth). The present transition state of ocean navigation, in which a substitution of steam for sails, and of steam vessels of enormous length for existing models, furnishes an independent and adequate motive for the use of timber for locks. While it would be imprudent to hamper navigation by "monumental" constructions of dimensions which might prove inade-

quate to the future, it would certainly be premature to build, in masonry, locks of the enormous length that some shipbuilders anticipate iron steamships are destined to attain.

We have but to add that the proposed railway, owing to local resources, and the extent of rich and productive countries which would become tributary to it, would command a lucrative traffic independent of interoceanic movements, and would be almost an indispensable auxiliary in the construction of a canal, in which capacity alone it would pay for its own construction.

We are, sir, respectfully, your obedient servants,

J. G. BARNARD,

*Col. of Engineers, Bvt. Major-General U. S. Army.*

J. J. WILLIAMS,

*Chief Engineer, Tehuantepec Railway Company.*

JULIUS W. ADAMS,

*Engineer of Public Works, City of Brooklyn.*

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(b) TEHUANTEPEC RAILWAY AND TRIBUTARIES.

*Extracts from the report of J. J. Williams, upon the location of the Tehuantepec railway and tributary lines, 1870.*

Leaving Minatitlan, the proposed head of present ship navigation, twenty miles up the Coazacoalcos river from the Gulf, the line takes the slope of the ridge north of that village, and passes just south of Cosuliacaque; thence just south of Tesistepec, following, with but slight variation, and for the purpose of correct alignment, the line of overflow; thence curving to the south and east of Lake Otiapa; thence curving southerly to the eastward of the hacienda of Almagro; thence nearly straight to within one mile west of Mount Encantada; thence curving westwardly and direct to the crossing of the Jaltepec river, about five miles west of Suchil, known as Hargousana. For this division of the road the line is quite direct, the curves of easy radius, and the grades gentle.

The principle governing in this location being to preserve the grade from about three to five feet above the level of extreme overflow, and at the foot of the slope of the high land which

constitutes the dividing ridge between the waters of the San Juan and Coazacoalcos rivers, and following this line, to preserve the shortest practicable route, to the crossing of the Jaltepec. At Hargousana the Jaltepec is crossed at the level of 110 feet above high tide at Ventosa. The line from thence south follows a depression in the ridge, and rises for one and one-half miles at the rate of sixty feet to the mile to the summit, which divides the waters of the Jaltepec from those of the Jumuapa river. This summit is just south of the Picadura to Suchil, and is 290 feet above high tide at Ventosa.\* The line thence running southerly descends for eight miles, crossing several branches of the Jumuapa, until it reaches the latter at Paso de la Puerta, with no grade exceeding sixty feet to the mile. Crossing the river at this place at a height of 155 feet above tide, the line then follows a branch of the Jumuapa, which lies in the direction of the route to the summit between the valleys of the Jumuapa and the Sarabia, a distance of six miles, two miles of which is at the rate of sixty feet to the mile, with a total rise in that distance of 195 feet. From this summit the line continues direct to the Sarabia river, a distance of four miles, over a gently undulating profile, and crossing the latter river at a height above tide of 305 feet, or a fall of but forty-seven feet in four miles, curves to the eastward, and, following a branch of the Sarabia for two miles, with a rise of twenty feet per mile, reaches the summit between the Sarabia and the Malatengo rivers, at a height above tide of 340 feet; thence following a tributary of the Malatengo over a gently descending grade (Arroyo de los Venados, about two miles south of Boca del Monte), it crosses the latter river about 280 feet above tide, and near its junction with the Rio Almaloyo, and skirting the base of the upland between the two rivers, takes the valley of the Rio Almaloyo, which it follows to the plains of Chivela, a distance of twenty-four miles, rising in that distance 410 feet, or a mean rise of seventeen feet per mile, with no grade of over fifty feet per mile. Still following a branch of the Almaloyo, it crosses the Chivela plains and enters the Pass of Chivela at a height of 773 feet above tide, or a rise of eighty-three feet in four and one-half miles. This is the extreme height of the grade

\* When reference is made to high tide, it means high tide at Ventosa.

at the summit pass which divides the waters which flow into the Pacific from those which flow into the Atlantic. From the summit of the Pass of Chivela for a distance of three and one-half miles the line descends a tributary of the Rio Verde on a grade of 116 feet per mile to the crossing of the Guichilona; thence by the valley of the Rio Verde three and one-half miles, on grades not exceeding fifty-three feet per mile, to Rancho de la Martar, at the base of the mountains on the Pacific plains. This point is 240 feet above high tide at Ventosa. The total distance from Minatitlan to Salina Cruz by this location is  $162\frac{1}{2}$  miles, which is composed of sixty-two miles on the Atlantic plains, sixty-six miles through the mountain division, and thirty-four miles over the plains of the Pacific.

The maximum grade is sixty feet per mile, excepting the grade through Chivela pass, which, ascending toward the Gulf, is 116 feet per mile, but only for a distance of three and one-half miles, and in operating the road an extra engine will be required to be used in assisting heavy northern bound trains over the summit. This should not be considered an unfavorable feature in the route, from the fact that on one of the greatest thoroughfares in the United States—the Baltimore and Ohio—the same grade was adopted in crossing the Alleghanies for a distance of sixteen miles.

The maximum curvature is seven degrees, or a radius of 819 feet, and this is only used in the pass of Chivela.

In estimating the cost of the Tehuantepec railway, I have before me the report of Major Barnard containing my original estimates, and also the reports of the chiefs of parties under Mr. Sidell. With these I am able to make the following approximate estimate of the cost of construction :

Auxiliary and carriage road between Minatitlan and the Jaltepec river .....	\$62,000 00
Auxiliary road from the Jaltepec to Salina Cruz .....	41,000 00
Clearing, grubbing, graduation, masonry and bridging, Minatitlan to the Jaltepec .....	1,200,000 00
Clearing, grubbing, graduation, masonry and bridging, Jaltepec to Salina Cruz .....	4,120,000 00
Superstructure, Minatitlan to Salina Cruz .....	1,271,922 28
Stations, buildings and water fixtures .....	216,000 00

Engines and cars.....	\$332,150 00
Engineering and contingencies, ten per cent.....	720,000 00

Total cost..... \$7,963,072 28

Or say, in round numbers, \$8,000,000.

This is the maximum cost; but during the construction of the road, in working up the location, and in the modification of the grades, tangents and curves, for the minimum expenditure, it may be considerably reduced.

Article No. 23 of the general regulations governing the construction of all railroads in the republic of Mexico, gives the company the right to make such changes in the line of location as they may deem proper and useful. It is very seldom that a railroad is constructed without some modification of the original location.

\* \* \* \* \*

As your instructions directed me to obtain as much additional information as possible, bearing on the subject of the railway across the isthmus, I take occasion to say that, notwithstanding all that has been said and written about Tehuantepec, I do not think that the isthmus has yet been fully described.

In the first place, a map should be made upon which can be laid down the coast and lateral railway lines which may be built to act as feeders to the main trunk line across Tehuantepec; and in order to do this the plan should include on the west as much of the States of Vera Cruz and Oaxaca as will take in the cities of the same names; on the east, the States of Tabasco, Chiapas, and a portion of Guatemala bordering on the Pacific; upon such a map should be projected the following connecting or branch lines. First, a road should be constructed from Medellin, already connected with Vera Cruz (twelve miles) by rail, to the harbor of Alvarado, a distance of about eighteen miles, over easy grades. Alvarado has one of the best harbors on the Gulf coast, and is about thirty miles from Vera Cruz.

The next should commence at or near San Nicholas, a hacienda on the San Juan river, at the head of steamboat navigation, about forty miles by water above the beautiful city of Tlacotalpan; thence by the valley of the same river fifty miles to the town of Paso San Juan; thence by the same valley thirty-five miles to Hargousana, on the Jaltepec river, there joining the



Tehuantepec railway. This line would comprise eighty-five miles of railway, and about seventy miles of inland navigation, and pass by the doors of the cities of Alvarado and Tlacotalpan. A good line may also be continued from the valley of the San Juan over an easy profile to Minatitlan, thus connecting the whole of the interior Atlantic slope of Mexico with its rich possessions on the Pacific coast by way of the proposed railway across the Isthmus of Tehuantepec, passing through one of the most productive regions in Mexico. To give you an idea of a portion of this route, I mention that when on my way down the San Juan river in a canoe, I estimated that about 100,000 head of cattle subsisted in this valley ; but on our arrival at Tlacotalpan, Mr. Schleskie, one of the oldest, wealthiest and most respectable inhabitants of that place, informed me that I was entirely below the mark, and that there were at least 500,000 head in that and its connecting valleys. In the construction of the road this will be an important item.

The second branch railway should start from Rancho de la Martar, or from the point where the trunk line will enter the mountains from the Pacific plains, and run easterly down the coast, over nearly level ground, to the harbor of Tonala, and continue through that part of the State of Chiapas bordering on the Pacific to the frontier of Guatemala.

Such a line as this would put the Tehuantepec railway in direct communication with one of the richest and most beautiful countries on the Pacific coast. I was informed by intelligent gentlemen on the isthmus, who live in Chiapas, that that State alone produces on the Pacific coast, annually, about 5,000 bales of indigo, 5,000 bales of tobacco, 50,000 arobas of sugar, 5,000 bales of cacao, 15,000 bales india-rubber, 6,000 bales cotton, 6,000 sacks of coffee, 50,000 hides, to say nothing of the corn, ginger, vanilla, sarsaparilla, and the immense amount of Brazil wood and other valuable products, all of which will be sent to market over the Tehuantepec railway. The entire population and products of the Pacific slope, for some two hundred miles east and west of the isthmus, would find the same outlet to market ; and, when the Vera Cruz and City of Mexico railway is completed, would be placed in direct and easy communication with the capital and the whole interior of the republic.

The third lateral railway should start on the Pacific coast, in the State of Oaxaca, at or near the outlet of the valley in which is situated the city of the same name, and run down to the harbor of Huatulco, thence to Salina Cruz, to connect with the Tehuantepec railway.

This would place the silver mining regions of the State of Oaxaca, as well as the city, in easy communication with the Gulf coast and the city of Mexico, by way of the Isthmus of Tehuantepec.

The great advantages of the proposed tributary roads are their extreme feasibility and the comparative ease and cheapness with which they can be constructed; the ground over which they would pass, for the greater portion of the distance, being nearly level plains.

The above, together with what has been said in Major Barnard's report, ought to convince the most skeptical that the *local business alone* would make the Tehuantepec railway a paying investment, to say nothing of the interoceanic traffic, from which a very large income may be expected with reasonable certainty.

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### (c.) INTEROCEANIC MOVEMENTS.

*Extract from the report of J. J. Williams, on the location of the Tehuantepec railway and ship canal, 1870.*

It is only necessary to look at a map of the world to be convinced of the immense relative advantages in position, above all others, which a ship canal across the Isthmus of Tehuantepec would offer to the commerce of the world, and more especially to that of the United States.

By this route the products of the valley of the Mississippi may be shipped from the Gulf ports direct for China, Japan, west coast of North and South America, and the islands of the Pacific; and the imports from those countries may be brought home to the ports of Texas, New Orleans, Mobile, Pensacola, and from thence transhipped to Memphis, Cairo, St. Louis, Louisville and Cincinnati, and be distributed throughout the Southern and Western States, even to the frontier of British

America, at one-third the cost of transportation of the same articles by the Pacific railroad. In a word, the completion of the ship canal across Tehuantepec will not only open a direct outlet from the Gulf of Mexico and the Atlantic to India and China, but also from the Mississippi river and tributaries, whereby the sea-going vessels plying upon those waters will be able to proceed with safety to any port on the Pacific; thus giving to St. Louis, the Queen City of the West, and the whole valley of the Mississippi, direct water communication with the Pacific side of North, Central and South America. In a word, the completion of the Tehuantepec ship canal would be the opening of the mouth of the Mississippi river into the Pacific ocean — another world of waters.

The isthmus belongs, in its greater part, to the State of Oaxaca, which has a population of 600,000, and the rest to the State of Vera Cruz, which has 300,000, and is bounded on the east by the State of Chiapas, which has 200,000. In these three States alone, from 8,000 to 10,000 good and hardy acclimated laborers, superior in strength and morality to the Chinese, can be had for less than fifty cents per day of twelve hours, and they board themselves; and, besides, from these sources, labor, to any extent that can be utilized, may be had from Tabasco and other parts of Mexico. This great enterprise itself would give work to thousands of the sons of that republic, now without employment, and, therefore, restless.

The following statement, condensed from official tables, shows the saving to the trade of the world, in insurance on vessels and cargoes, profits on time saved, interest on cargoes, saving of wear and tear of ships, saving of wages, provisions, etc., by using the Tehuantepec canal:

United States .....	\$35,995,990 00
England .....	9,950,948 00
France .....	2,183,930 00
Other countries ...	1,400,000 00
<b>Total yearly saving.....</b>	<b><u>\$49,530,208 00</u></b>

If the trade increases annually ten per cent, or one hundred per cent in the next decade, the saving to the world will then be double the above amount.

As the annual increase of the trade of Great Britain, France, and the United States, is, together, more than ten per cent, the saving to the maritime powers of the world of \$49,530,208 in one year, at the end of ten years will be \$99,060,416.\* Assuming the trade only of the three powers to increase in the same proportion, the aggregate total amount saved at the end of ten years will be over \$700,000,000.

Suppose the average tonnage of ships to be over 1,000 tons each, then, as per the tables in this report, 3,049 ships would be requisite to carry the freight, which would now annually seek the isthmus route. Abert, estimating for Darien or Panama, makes the annual saving for each ship \$15,420, giving, as the aggregate saved upon the tonnage which would pass the isthmus, the sum of \$47,709,480; and the saving of one year, at the end of ten years, would be \$95,418,960; sums sufficiently near the first to establish their correctness.

Again, by a comparison of time and money, in the passage of a 1,000 ton ship from New York to California, *via* Cape Horn, with what it would be by way of Tehuantepec, it is estimated † that the saving on the ship and cargo would be \$13,300, or thirteen dollars and thirty cents per ton, against a toll not to exceed two dollars and fifty cents per ton. Allowing the ships to make but four trips per annum, of forty-five days each, *via* the canal, it would give a yearly saving of \$53,200. Deducting \$10,000, the toll on the four trips, there results a net annual saving on a single 1,000 tons ship of \$43,200.

Whale ships and coasting vessels have been estimated generally at forty dollars per ton. The United States and European commerce around the capes is conducted in first-class ships, which often cost eighty dollars per ton. Fifty dollars has, therefore, been taken as a fair average value, in the construction of these tables, which do not include coasting trade nor the trade of any of the powers of the world, except England, France and the United States.

\* See Report of S. J. Abert, C. E., entitled "Is a Ship Canal Practicable?"

† Vide "Engineering," London, Vol. V, first half yearly.

The following tables show the trade of the United States, England and France, which would probably pass through the isthmus canal if now finished, taken from the official returns of 1857 and 1858:

TRADE OF THE UNITED STATES WHICH MUST PASS THROUGH THE CANAL.

Countries traded with.	Tonnage.	Exports and Imports.
Alaska .....	5,735	\$126,537
Dutch East Indies .....	16,589	904,550
British Australia and New Zealand.....	52,105	4,728,063
British East Indies .....	177,121	11,744,151
French East Indies .....	8,665	98,432
Half of Mexico .....	34,673	9,601,063
Half of New Granada .....	181,708	5,375,354
Central America.....	36,599	425,081
Chili .....	63,749	6,645,634
Peru .....	193,181	716,679
Ecuador .....	1,979	48,979
Sandwich Islands .....	33,876	1,157,849
China .....	123,578	12,752,062
Other ports in Asia and Pacific.....	4,549	80,143
Whale fisheries.....	116,730	10,796,090
California to East United States .....	861,698	35,000,000
Value of cargoes .....		\$100,294,687
Total tonnage.....	1,857,485	
Value of ships at fifty dollars per ton .....		92,874,250
Total value of ships and cargoes .....		\$193,168,937

TRADE OF FRANCE WHICH WOULD PASS THROUGH THE CANAL.

Countries traded with.	Tonnage.	Exports and Imports.
Chili .....	25,688	\$10,000,000
Peru .....	35,096	13,160,000
Half of Mexico .....	10,004	2,790,000
Half of New Grenada .....	2,389	1,090,000
Ecuador .....	1,650	440,000
Bolivia .....	1,000	100,000
California.....	8,997	2,073,859
China.....	2,028	2,180,000
Dutch East Indies, } Outward only.....	20,400	4,440,000

Sandwich Islands .....	4,119	\$2,000,000
Philippine Islands.....	1,468	1,000,000
Australia .....	50,000	19,800,000
Value of cargoes .....		\$59,078,859
Total tonnage.....	162,735	
Value of ships at fifty dollars per ton .....		8,136,750
Total value of ships and cargoes.....		<u>\$67,210,609</u>

TRADE OF ENGLAND WHICH WOULD PASS THROUGH THE CANAL.

Countries traded with.	Tonnage.	Exports and Imports.
Half of Mexico.....	11,833	\$2,775,137
Half of Central America.....	5,615	1,244,817
Half of New Grenada.....	10,188	2,437,605
Chili .....	118,311	15,486,110
Peru .....	224,319	20,478,520
Ecuador.....	1,820	360,015
China .... }	16,853	7,077,390
Java .... } Outward only.....	16,003	3,821,410
Singapore }	16,500	4,364,070
Australia .....	522,426	78,246,095
Sandwich Islands.....	1,950	520,560
California .....	11,800	2,378,105
Value of cargoes .....		\$139,184,834
Total tonnage.....	1,029,295	
Value of ships at fifty dollars per ton.....		51,464,750
Total value of ships and cargoes.....		<u>\$190,649,584</u>

The value of the tonnage which would take the Tehuantepec route is, according to the above tables :

United States .....	\$92,874,250
England .....	51,464,750
France .....	8,136,750
	<u>\$152,475,750</u>

Total value of exports and imports, taking the same route, is :

United States .....	\$193,168,937 00
England .....	190,649,584 00
France .....	67,210,609 00

Total value of trade of the three powers passing the isthmus .....

\$451,089,132 00

Estimated tonnage to pass through the canal:

United States.....	1,857,485
England .....	1,039,395
France .....	163,735
Total tonnage .....	<u>3,049,515</u>

Upon the above tonnage, the yearly income, at two dollars per ton, would be \$6,999,030, which is the estimated annual gross receipts from tolls upon ships belonging to the United States, England and France.

This calculation does not include the United States coasting trade on both oceans, nor the trade that might be expected from the other nations of the world not mentioned.

The amount of \$2,500 toll, now charged on a ship of 1,000 tons on the Suez canal, would increase the above estimated yearly income on Tehuantepec to \$7,625,000. This amount, based upon the yearly ten per cent increase, would double itself in ten years.

In 1860, the maritime movement between Europe and the East, by way of the Cape of Good Hope, amounted to 7,250,000 tons. The ascertained rate of progress would give for 1870 a total of 11,000,000 tons, one-half of which, at least, would pass through the Suez canal, and possibly a fifth by way of the American isthmus.

Taking these facts into consideration, and bearing in mind that none of the trade of the western hemisphere is included in the 11,000,000 tons, it remains for commercial men to say whether or not we are correct in estimating an annual amount of 3,000,000 tons as likely to pass through the American isthmus.

I have the honor to be, very respectfully,

Your obedient servant,

J. J. WILLIAMS,

*Chief Engineer Tehuantepec Railway Co.*

## XI.

CONTRIBUTIONS TO THE PHYSICAL GEOGRAPHY OF  
THE MISSISSIPPI RIVER, AND ITS DELTA.

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BY REV. EDWARD FONTAINE.

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READ DECEMBER 26TH, 1871.

This essay describes the peculiarities of the scenery of the river and its bottom, where De Soto first saw it, from Memphis to Vicksburg. The sawyers, islands and tow-heads. Its crumbling banks and the shifting of its channel. Causes explained. Peculiarities of the scenery and climate of the lower coast. Temperature of the river and gulf, and its cause, and effect upon the vegetation of this part of the delta. The northers, typhoons and whirlwinds described, and an explanation of their cause. The insects and reptiles of the delta. Separate lectures are devoted to "the mud lumps," "salt islands" and "the cause of the velocity of the current of the Mississippi," and verbal extracts from them, explain these subjects which are embraced in the physical geography of the river.

## THE MISSISSIPPI RIVER.

*Contributions to its Physical Geography.*

The first time I ever saw the Mississippi river was in the month of December, 1838. The Chickasaw Indians, who had for several centuries occupied the northern part of Mississippi, had sold their lands, embracing about a third of the whole area of that State, to the United States in 1833, and had all migrated to the territory ceded to them west of the great river. The country of De Soto



had been organized, and the new town of Hernando built, and emigrants from all the other States were pouring into the country, and commencing their improvements upon the sites of the wigwams and the fertile hunting grounds of the 6,000 Indians who had relinquished their valuable heritage forever to our race. The celebrated John Wesley, the founder of Methodism, while he was a missionary in the colony of Georgia, during the administration of Governor Oglethorpe in 1739, described the Chickasaw Indians as being then in number and character precisely as they were 100 years afterwards. He said they numbered about 6,000, and that they were the most truthful and honorable of all the savages of America who had any intercourse with the English. It was through their country that De Soto marched in his adventurous search after El Dorado of the West. They treated him with great hospitality until he provoked their hostility by his rapacity and cruelty. They then fought him gallantly, and he vainly attempted to subdue them. They marked every step of his advance, from the Tombigbee river to the Mississippi, with blood. They destroyed the most of his horses and many of his soldiers, and he only escaped from their fury by crossing the Mississippi, which was the western boundary of their territory, and by continuing his march with his shattered forces in the dismal and malarious swamps on the opposite shore. As late as 1836, about 292 years after their war with the Spaniards, these Indians had preserved a distinct tradition of De Soto and his barbarities, and spoke of the invaders with detestation and horror. They loved the English, who had an agency among them in 1760, and it was their boast that they had never shed the blood of a white man. They regarded the swarthy Spaniards, mailed in iron and mounted upon horses, animals which they had never seen, and armed with muskets and artillery, as supernatural and destructive demons; or men of a different race from themselves or the white colonists of England. They took no part in the war of the revo-

lution or in that of 1812. The United States paid them \$3,000,000 for their lands, and reserved to each Indian a section of land, leaving it optional with them to remain upon their reservations under the laws of Mississippi, or to go to the lands assigned them in their Trans-Mississippi territory. They preferred selling their individual property and migrating. The treaty and its honest observance was highly honorable alike to our government and to the Indians. They were about 6,000 in number, and the treaty made each Indian worth about \$5,000 in gold ; and they were the wealthiest nation in proportion to their numbers in the world ; 2,000 of them had made a profession of Christianity. Many were civilized planters and stock raisers, and some of them owned large numbers of negro slaves and herds of cattle. For their civilization they were mainly indebted to Gen. Washington, through one of their chiefs named Colbert, who died at a very advanced age, after the treaty and before their migration. He visited Gen. Washington in Philadelphia while he was president, and brought back with him a small *shovel plow* which he presented to him, and which was carefully preserved by him in his house until he died. It was a great pleasure to the venerable chief to relate its history to his white guest, and to repeat to them this speech which Gen. Washington made to him when he presented it : "When you go home, tell your people that if they attempt in this age to live as their fathers did, by *war* or by *hunting*, they will perish and pass away from the earth like the many tribes who have died where the white men live. But if they will quit war and hunting, and make corn with the plow, and use the tools of the white men in clearing their land, building houses and cultivating the earth, and if they will raise horses, cattle and hogs, and, adopt the religion and customs of civilized and Christian nations, they will live long and prosper as a people." Colbert and all the principal men of his tribe adopted this wise advice ; he died possessed of great

wealth after living long as the benefactor of his race, and his nation is yet prosperous. I have said this much about this interesting tribe of aborigines, because it was through their country that De Soto marched to the Mississippi, which he reached in their territory. The precise point where he first saw it has never been certainly determined. The Chickasaw tradition, that it was at the present site of Memphis, is probably correct. Recent historical investigations, made since the white settlers of "the Chickasaw nation" named the country *De Soto*, and its county seat *Hernando*, in honor of the brave and enterprising Spaniard, made it clear that he did not discover the Mississippi in 1542 or '44, nor did La Salle anticipate other European adventurers in finding its mouth more than a century later. The narrative of the travels and voyages of Cabeza De Vacca, translated by the late Buckingham Smith, proves that this Spaniard, Alvar Nunez Cabeza De Vacca, discovered its mouth Nov. 2, 1528. In sailing from the coast of Alabama west, he passed the mouth of the Mississippi, and his narrative gives such a description of the outlet, and the peculiarities of the adjacent coasts which he saw, as will be recognized by any person who has ever seen "the passes," as they are termed, and "the mud lumps" about them. He found a great body of fresh water rushing out with a strong current into the Gulf of Mexico. He endeavored to ascend the river, whose water he drank far from the land, but a "norther" was blowing at the time, and the combined force of the wind and river current prevented him. No sailing vessel can enter either of the passes and ascend the river in the teeth of the wind and the river current. But, although Columbus did not discover America, nor La Salle nor De Soto the Mississippi, they and the hardy heroes who were their companions and cotemporaries deserve all the admiration and gratitude we can bestow upon their memories. Their skill and daring certainly gave America to Castile and Leon, to Portugal, France,

England, Denmark, Holland and Russia. Their valor, fortitude and sublime enthusiasm overcame perils and obstacles formidable as the fabulous Cyclops, Lestrignons and Scyllas braved by the mythical heroes of antiquity, and they deserve the lays which have been sung and the monuments which have been reared to perpetuate their fame.

The point where I first saw the Mississippi, and which I must introduce, as it first impressed me and excited my curiosity to explore its wonders, was interesting, not only as being near the spot where De Soto crossed it, but as one occupied by the predecessors of the aborigines whose arms he encountered. That part of the valley of the Mississippi, including the area between the Cumberland mountains where they terminate near Tusculumbia and Florence, and the mouth of Big Black river, and embraces the valleys of the upper tributaries of the Tombigbee, with the country watered by Wolf river, and all the affluents of the Yazoo and Big Black, was once densely inhabited by "the mound builders" who preceded the Indians who occupied America in the time of Columbus. All the more fertile parts of the lands of the Choctaws and Chickasaws which lie within the limits of Mississippi, and formerly in a part of Alabama and Tennessee, show the former occupancy of a much more numerous and more highly civilized race, whose remains are found wherever I have examined the rich lands of the west between the Allegany and the Mississippi. The whole valley, from Cairo to the mound of Point a la Hache on the bank of the river, fifty miles below New Orleans, is full of them. They are found not only on the Ohio, and the Trinity river, in Texas, but in every situation between those points which would now be selected as a favorable spot for planting and farming by a skillful agriculturist of the present age. The Choctaws and Chickasaws did not claim the builders of these tumuli as their ancestors, and knew nothing about their history. But the Egypt

of this extinct race was the whole of the western part of Mississippi, including the fertile terraces of the present river bottom called "the Bluffs," and the wide area of alluvium irrigated by the Yazoo and the numerous bayous which connect it with the Mississippi, and which, if they were not canals made by them, were certainly leveed and controlled, and utilized for agriculture, navigation and commerce. On examination of the levees which they constructed upon the banks of these natural or artificial canals, and the multitude, magnitude and scientific construction of the various kinds of mounds which are so numerous as to give to the *Yazoo-ok-hinnah the River of Ancient Ruins*, will convince any antiquarian that multitudes of industrious toilers, as numerous as those which swarmed upon the lower Nile, and built its canals, pyramids, temples and cities, navigated the waters and cultivated the lands of this region in past ages. When I explored it, the white emigrants had commenced making their settlements in it. The Chickasaws had migrated. The ancient canals, levees, pyramids and their former fields were all covered with the dense forest, and the neglected and unrestrained waters reflected the dismal scenery of a vast and fearful wilderness. The Indians, in the dry seasons when the waters had receded, penetrated portions of this region, where their predecessors built, labored, flourished, faded and passed away. De Soto got involved in the intricacies of these great forests and impassable bayous, and, poisoned with malaria and worn down with toil and want, he died. From the town of Hernando, named after him, going west I examined the aboriginal ruins of the Mississippi bottom, and passed through what was the most populous portion of their ancient domain, favored by a very dry season and pleasant weather, when the Mississippi was at its lowest stage of water, and I saw it for the first time thirty miles below Memphis, near the present site of the town of Commerce.

About a mile in width, between deep banks twenty or

thirty feet high at that point, the immense volume of dirty, yellowish-brown water rolled along swiftly and silently. It was a grand and fearful-looking object, and my first view of it excited my admiration, mingled with a degree of terror. Not a human habitation was in sight, and no vestige of the work of man appeared to cheer me. Three large quadrangular pyramids, the work of an unknown and extinct race, were near me, and only served to deepen the gloom of the forest which shaded both shores. I could not call it a *primeval wilderness*, because these mounds, and many others which I had passed, and the well leveed bayous I had crossed, proved that all the older alluvial bottom had been cleared and cultivated ages ago by the vanished race who constructed these immense works now, covered with great trees, bushes, cane and tangled vines. Where the strong current of the river flowed against a precipitous bank of stratified sand and clay of various colors, the whole mass, for a half mile in length, was tumbling into the excavating tide, and one of these mounds with all the trees upon it had lost half of its bulk, and was falling into the muddy waves, to be transported to form the delta of Louisiana, or to build up some part of the gulf or ocean, or else to add to the new land of some distant island or continental shore. From the opposite bank a yellow sand-bar, laid bare by the shrunken winter volume of water, projected for a quarter of a mile. The wreck of a flat-boat was stranded upon it, and the whole bed of the river was studded with what are termed *sawyers*, more exposed at low water, but not more dangerous than when it is higher, and when their projecting points are covered slightly and concealed thoroughly by the turbid current. These sawyers are the most formidable pests to the navigation of the great river, when the sand and mud-bars can be passed. They are long-seasoned logs fastened to the bottom of the river, with their points turned down stream, and aimed directly at the prows of all vessels ascending

the mid-channel. They are formed abundantly from August until the river sinks to its lowest point, by the caving of the banks, which are undermined by the deep and rapid bottom-current, and as the surface falls below the layers of clay from underneath which the sand has been washed out, the clay and surface soil are left without support, and the banks topple down and fall, with a sullen roar, into the river, with the trees, and often with the houses, and, in the course of a few years, with all the plantations on this part of its restless and ever-shifting course. The trees, many of them more than 100 feet long, divested of the earth adhering to their roots, float off toward the Gulf of Mexico ; but if much tenacious clay sticks to them, their roots are sunk beneath the surface, and their buoyant tops swim with the tide until the heavier butts drag upon the bottom and fasten to it ; the floating tree then stops ; its roots are deeply buried by the moving sand and all that rolls upon the river bottom. The lap of the tree, with all its out-spread branches, are swayed in the direction of the current, while its roots are firmly anchored. All the branches which extend laterally are broken off by the heavy drift-wood which is hurled against them with force, as they are borne along at a velocity which averages four miles per hour. In high water, even in the Delta, the current of the Mississippi flows at the rate of five miles an hour, and it is almost incredible that a log is borne by it in a single day 120 miles.

This drift-wood, aided by the flat-boats and steamers which glide over it, breaks off the branches and sharpens the trunk of the tree, and completes the manufacture of the dangerous *sawyer*. It is a long and elastic tree ; it is pressed down by the heavy volume of water when a strong eddy rolls over it, but its elasticity makes it spring up above the surface again ; and thus it sinks below the water level, and rises again with the regularity of a great pendulum. It is this up and down movement, like the

working of an old fashioned *whip-saw*, which has given these terrible snags the name of *sawyers*. At low water they are seen everywhere between Cairo and Baton Rouge, but more abundantly below Memphis, obstructing the channel with their inclination about that of the muskets of a line of infantry prepared to receive a charge of cavalry, with the butts of their weapons planted firmly upon the ground, and their bayonets pointed toward the breasts of the advancing horses. Woe to the ascending steamer whose prow or hull meets the sawyer's point ! A stunning shock suddenly arrests its course. The huge beam crushes through the bottom and decks, and rends a vast orifice which lets in the rushing waters. Its fires are extinguished, and its wheels are stopped ; spitted, impaled and powerless, it sinks to the bottom. If the water is deep, and it is far from shore, and especially if it is in the winter, or in the night, not only is the boat and cargo a total loss, but few of those on board escape with their lives. The banks of the river are strewn with the wrecks made by these sawyers. How often have you read the brief newspaper items : "The steamer —— struck a snag near the mouth of White river, and went down in deep water. Boat and cargo a total loss—passengers saved—passengers drowned." The stumps and trees standing upon the caving banks have their roots in such friable and crumbling soil, that they make very insecure supports for the fastening of the hawsers of the steamers. At high water the river is within a few feet of the tops of these precipitous banks, which are generally used as wood-yards for the convenience of steamers which can run in the deep water which flows against them, and take on the wood without difficulty. But, in doing what is called "rounding-to to wood," it is necessary to throw out a hawser and fasten it to a tree or stump. If this is near the edge of the treacherous bank, when the weight of the boat, borne down by the current, pulls against it, the bank "gives way," and down comes the tree or stump and the



vessel floats off. These unstable banks, the sawyers and drift-wood give origin to some queer but very expressive western sayings. When a man proposes to form a partnership with another with whom he is not very well acquainted, and consults a friend who knows him, whether his association with him would be prudent, he is told, if he is unreliable, that "he will not do to tie to." He is like a stump that will not hold the steamer fast. The famous confederate cavalry leader, General J. E. B. Stuart, who was a very ardent and fast friend, in writing to his associates, usually subscribed his letters, "Yours to tie to." An allusion is made to the sawyer, when a rash individual encounters an antagonist whom he expects to vanquish easily, but is mistaken, and gets woefully defeated. It is said that "he ran against a snag." When an inhabitant of the Mississippi bottom wishes to assure you how a thing apparently difficult and dangerous can be performed in the easiest manner possible, he draws his illustration from the drift which covers abundantly all the lakes and bayous, as well as the surface of the great river. Upon this drift-wood myriads of water terrapins, snakes and alligators lazily bask in the sun. When suddenly alarmed they drop from it instantly and disappear in the water. The Mississippians tell you that the thing can be done "just as easily as falling from a log." These people express their detestation of the leaders and members of the corrupt rings who plunder the public money, and hold it with a miserly clutch, callous to popular censure and deaf to the voice of conscience, by averring that the hardened villain has "the grip of a snapping-turtle and the hide of an alligator." But when I first saw this famous artery—the great Aorta of North America—it was, as I have said, in a wilderness in the early part of December, when the water was at its lowest stage. It was unusually shallow upon the bars, so much so that the great steamers were not running, and the mosquitoes, snakes, turtles and alligators had all gone into winter

quarters. The modern aborigines had moved away ; the white emigrants had not taken their places in that wilderness ; the mighty river was flowing by the temples and ruined abodes of the primitive mound-builders, whose dust was in the graves around me, and in solitude and silence I contemplated the scene, and studied its mysteries without molestation. The sawyers had been planted by the fall and rise of the last season, and were ready for mischief. The low islands and the near and distant points of land were singular looking objects. The last three years' deposits of the river were plainly marked, and presented a great similarity of appearance on all this uninhabited part of the river. A description of it will give an idea of the greater part of the most extensive area between Memphis and Vicksburg, where the bottom is the widest, and no high land is in sight from the river. Evergreens, like the water-oak, bay, wild peach and magnolia are only found upon the alluvium which has been deposited for many years. The live-oak and Spanish moss are not found above the thirty-third degree of north latitude. They both require a warmer temperature and the breath of the south-east monsoon for their support. But on the newly formed islands and the points of the convex bends, no evergreen trees were visible. First appeared the recently made sand-bar, clean and bare, ready to receive the loam to be deposited upon it the next year. Above this rose this land made by the last rise, covered with straight switches of young willows, which had grown up since the waters commenced receding in July, and which varied in height according to their age, represented by their distance from the water's edge, from two or three inches to four or five feet. Elevated a few feet above this last formed alluvium arose that of the preceding year, supporting a dense thicket of willows and cotton-wood, twenty or thirty feet in height. Yet more elevated was a third terrance, bearing large trees, generally the same kind of cotton-wood

and willows, the varieties common on all the waters of the south-western States emptying into the Gulf of Mexico, and described by Michaux and other writers on our American sylvia as the *populus angulata* and *salix nigra*. Some of these poplars or cotton-wood trees, when three years old, attain a height of forty or fifty feet. The French give the name of *batture* to all the alluvium of the river three years old. The last terrace, or the fourth of this very recent formation, is the most elevated part of the bottom. Its age can only be ascertained comparatively by the superior size of the forest growth, which includes the sweet gum or *liquid amber*, and the elm, hackberry, box-elder, linden, mulberry, and, where it is oldest, all the forest trees of the southern States, except those which grow upon uplands exclusively, or poor and sandy bottoms, like those of the Pearl river of the Mississippi and the Sabine of Texas, which produce the pine, black-jack oak and other trees indicative usually of a sterile soil. But on the newly formed islands and projecting points of the part of the river I am describing, between Memphis and Vicksburg, the cotton-woods and willows, interspersed with a few sycamores, are the most prominent growth; and as they cover the new *batture* so densely as to be almost impenetrable, they grow very straight in struggling upward to enjoy the light, and their tops terminate in long narrow cones, while the old cotton-woods, more than 100 feet high, on the margins of the *batture* and caving banks, send out their branches laterally, while their tops assume a hemispherical or dome-like appearance. In the winter these deciduous trees lose their leaves, and the gray color of their bark and innumerable branches and twigs, unrelieved by any other hue, give these islands and points of land a very weird and wintry aspect. Their color and form have caused them to be called *tow-heads* by the boatmen. I have now given you some idea of the most striking objects of view on this part of the river—the sand-bars, *sawyers* and

*low-heads.* It is easy to see how these alluvial islands are made. The rapid current of the Mississippi, acting upon its own stratified alluvium of alternate layers of sand and clay, and undermining continually, and sweeping away the forests which grow upon its banks, shifting its channel sometimes from ten to twenty miles in less than a century, and bearing down to the Gulf by its deep and irresistible tide the entire growth of many thousands of square miles, as it shifts its deep bed from one side of its valley to the other, enables us to account for the peculiarities of its formations, some of which differ from those of all the other great rivers of the earth. None of them have so swift a current, or bear to the ocean such tributes of floating forests.\* An examination of a section of its banks will show how it performs its destructive work of undermining its forests, the levees, fields and abodes of its inhabitants. It must be remembered that its bottom current is as swift as its surface, and that the average velocity of the whole volume of the river is four miles an hour or ninety-six miles a day. The bottom current flowing against a bank washes out the sand which supports the clay. As I have mentioned, the whole then falls into the deep water. I have seen as much as five acres fall into the boiling eddies and suddenly disappear. In 1844, in the month of August, while the waters were falling, I traveled up the right bank of the river, from one point to another, twenty-five miles, opposite the cities of Grand Gulf and Rodney. In many places, by the rise of that year, the levees and roads had been cut in two and swallowed by the engulfing waves. I had often to

\* None of these rivers flow like the Mississippi, along a meridian, on from the poles toward the equator. Its course is near 110° longitude W. from Greenwich, and the centrifugal force of the earth, which elevates the ocean under the equator thirteen and a half miles above the *globe level*, and where action upon the earth's surface is from the poles toward the equator, hurls it in that direction with fearful velocity. The Nile and La Plata, nearly the same size with the Mississippi, flow from the equator toward the *poles*, and have their velocity *retarded* by the same cause.

make wide detours to avoid the cracks and crumbling ground, and to drive through the cultivated field at a safe distance from the devouring tide. While driving 100 yards from the river, which was on my *right*, I observed, twenty feet *before* me and flanking me on the left, a fresh crack, about six inches wide and very deep, extending from the river far into the field. I drove rapidly across the chasm, and had not passed it thirty yards when the entire mass, bearing more than an acre of cotton, sunk behind me and vanished with a fearful roar in the inrushing eddies. The levee, road and front yard of the large residence of the wealthy owner of the plantation had fallen, and I observed a fine old Lombardy poplar, which had been undermined, floating on the water, and hanging to a disintegrating bank by a few of its roots. A beautiful avenue of its companions had all been washed away, and it was on the eve of its departure to follow them on their voyage to the "passes," and to join the drifts of the winds and currents of the Gulf. I found the family busy moving the furniture and valuables of all kinds to some temporary house, hastily erected a mile distant from the river, and preparing to abandon their residence to its inevitable fate. A few years afterward I passed the spot, on a steamboat, and the captain of it told me that the deepest part of the river then flowed where that mansion once stood.

The islands are formed by the trees which are undermined and floated away. The tops and branches of whole clusters of the largest of them, supporting masses of grasses, of grape-vines and creepers, are tied together by them, and in that tangled condition are borne off by the current. Then if their roots lodge and anchor to the bottom, their branches catch all the boulders of clay, water-logged timber, and all floating materials borne against them, and they thus form an obstruction which the water cannot undermine or remove, and it becomes the nucleus of an island. These numerous islands are

rapidly formed and grow continually, but they are not permanent. They part the waters of the river, and deflect them with destructive force to the right and left against the areas covered with wild forests or cultivated fields, to sweep them away. But, by an accumulation of drifted trees, one or the other of the new channels becomes blocked up and closed by a sand-bar. This is exposed at low water, and the seeds of the willow and cotton, covered with downy wings, are sown upon it thickly by the winds, and spring up rapidly to form a young forest. This catches the wind and drift, borne by the flood of the next annual *rise*, and the land is elevated by it several feet. The island is thus attached by it to the mainland. You can easily imagine that there is nothing permanent upon the banks of this part of the Mississippi. Whoever builds upon it will find himself like the "foolish man who built his house upon the sand." It may stand the thunder gusts and northers from the Rocky Mountains, and the hurricanes and typhoons from the south-west, but there is no rock beneath his foundation to resist the descending flood which will excavate the sand and engulf his works. An artesian boring of 630 feet in depth, made in New Orleans in 1856, reached no rock. You can also understand why there is nothing beautiful, but much that is fearful, in the aspect of the river on this section of its course. It is a clear and lovely river after it receives its upper tributaries, and makes its descent over the falls of St. Anthony, and it maintains its mingled grandeur and beauty until it receives the turbid volume of the Missouri below St. Louis. This tributary is the great river, and the entire stream should be called the Missouri.\* It seems to absorb the clearer and less turbulent Mississippi, and impresses its character upon it to its mouth. It descends in swift and boiling eddies, loaded with the sands of the American desert borne into it by the Platte,

\*The Missouri bears the same relation to the Mississippi which the Madeira does to the Amazon.

and discolored by the oxide of iron which paints the Yellow Stone. It obliterates the transparent beauty of the Mississippi with its muddy tide. It receives large accessions of iron paint from the ocherous waters of the Arkansas and Red river, and rolls this sand into the Gulf of Mexico and discolours its surface near its northern shore, as it is carried by the eddies of the Gulf stream from the Passes to Florida. While standing upon a precipitous bank, or the deck of a steamer, you cannot gaze upon the Mississippi, where I first saw it, without a sensation of awe. No object can be seen an inch beneath the surface of the muddy eddies, which boil up from the depths below and whirl by with noiseless but Titanian force. You cannot conjecture how far below the very spot on which you stand, the sand of strata may be undermined, and you fear that the ground may give way beneath your feet, and the treacherous waters swallow you; or if you are on one of those great passenger steamers, although you may be charmed by the beauty and conveniences of "the floating palace," propelled with volcanic power against the current, you cannot avoid thinking not only of "the safety valves" of your mighty carrier, but of the hidden snags and sawyers aimed at you from the concealed depths, and you dread the moment when one of their points may crash through the hull and sink you to the bottom. In the months of spring, when the water is colder than the air of the semi-tropical regions of its lower course, dense fogs shroud its bosom. Its current at all times of the year is generally silent, and a solemn stillness in the air is often pillowed upon its restless waters. It leaves all noisy sputtering and chiming to be made by its little children, which fall in cascades and cataracts from the Allegany, Ozark, Cumberland and Rocky Mountains. The roar of the great father of waters is only heard in the heat of summer, when he bursts the levees vainly imposed to fetter his strength, and when rivers large as the Ohio are poured through great

crevasses to sweep away the habitations and plantations of whole counties. Then the roar of his waters is like that of Niagara. He roars again, like Charybdis, when he undermines these levees, and receives into his capacious jaws whole acres of solid land and all that rests upon it. The high hills of Vicksburg, Natchez, Baton Rouge and other portions of "the bluff formation," which rise above the bottom, to an elevation of from 150 to 300 feet, are very fertile, and produce abundantly tall magnolias, mingled with the large yellow poplar, or tulip tree, called "the pride of the forest of the United States." The preponderance of the beautiful evergreen *Magnolia grandiflora* over all the other forest growth, give these elevated points of land a very cheerful appearance in mid-winter, even where they are not crowned with cities, and with the country residences of the wealthy planters, which are usually ornamented with great taste. These bluffs have been examined and correctly described by Sir Charles Lyell, as belonging to the alluvium of the great river. He supposes the whole valley to have been upheaved, and the present bottom to have been formed since that event.

It is not, I think, necessary to suppose any upheaval in order to account for the elevation of this ancient bottom called "the bluff formation," upon which the cities of Memphis, Vicksburg and Natchez are situated, and the escarpments of which are the high hills of Grand Gulf and Baton Rouge, Ellis Cliffs and Port Hudson. This river terrace contains a large area of the most fertile and beautiful uplands in the western limits of Tennessee, Mississippi and the part of Louisiana on the left bank of the river, above the Delta. Remains of it are found in other portions of Louisiana west of the Mississippi, among which are Sicily Islands and the elevated row of salt islands, in St. Marys parish, situated on Atchafalaya, Cote Blanche and Vermilion Bays. I will endeavor to account for their present elevation above the new bottom



of the river, when I call your attention to the ancient river which formed the bed in which the modern Mississippi is now at work. The great fertility of the alluvial soil of this elevated terrace, upon which Vicksburg and Baton Rouge and the intervening cities are situated, in the warm climate of  $31^{\circ}$  and  $32^{\circ}$  north latitude, and aided by the moist and balmy south-east monsoon, produces a prolific growth of indigenous semi-tropical vegetation. The primeval forests which yet remain are ornamented with magnolias of immense size, whose large white flowers perfume the air in spring, and whose glossy evergreen leaves give the land in winter the appearance of summer. The principal undergrowth is the beautiful evergreen, wild peach and holly, associated with other small trees and bushes which retain their purple, crimson and scarlet fruit in the winter. The marshy lands and dry bottoms are enlivened in mid-winter by the green garments with which they are robed by the bamboo vines, palmettoes and dense cane brakes. The magnolia grows indigenously upon the older deposits of the Mississippi and its bayous, from the parallel of  $32^{\circ}$  to the borders of the Gulf of Mexico. From latitude  $30^{\circ}$  to the sea-shore it is associated with the lovely live-oak (*quercus virens*), groves of which, growing spontaneously, or planted in avenues or clusters, form attractive objects in the scenery of the banks of the lower Mississippi. After receiving the waters of Red river, the last of its great tributaries, its vast volume loses nothing of its velocity, but the landscapes about it are improved in appearance by the numerous improvements of the planters. The forests are well cleared from the margins of the river, which are elevated high above the swamps on either side, which appear from a half mile to two miles distant covered by a dense forest of cypress, tupelo, gum, and a variety of other

NOTE.—The term "upper coast" is applied to the banks of the river between New Orleans and Baton Rouge, and the country bordering it from New Orleans to its mouth is called "the lower coast."

trees which grow in the water. But the tall cypresses give an impressive character to the scenery. Their trunks are straight and without branches to a great height. Their limbs are sent out laterally from near the top of the tree, and the crests of these cypress forests are not serrated with domes, cones and pinnacles, or indented in their outlines like those of other trees, but they form a horizontal plane parallel with the surface of the swamps on which they grow. They are festooned with the Spanish moss. In the winter, when stripped of their foliage and draped with the pendent masses of this gray moss, they present a dismal, funereal aspect to the stranger, who cannot look upon them without thinking of disease and death, and of all that is suggested to the mind by "the sable drapery of the tomb." But such gloomy reflections are dispelled by the objects which attract the sight upon the cleared and cultivated shores as we approach the great city of New Orleans. The mansions of the planters are often constructed with a regard not only to comfort and convenience, but display some architectural taste. They are generally built in the French or Spanish style, with one or two stories pillowed, verandah surrounding them, to admit the sea breeze and exclude the heat of the sun, and they are embowered amid live-oaks, magnolias, cedars and exotic evergreens, well cultivated gardens, which produce most of the vegetables of the temperate zones in the winter as well as in the summer, and orchards of Japan plums, oranges and other varieties of citric fruits, as well as grapes, peaches, pears and plums. The soil is fertile beyond conception. Its capacity for the production of varieties of fruits, vegetables and ornamental plants has never been fully tested. The rich alluvium cultivated is devoted chiefly to making sugar, and the large establishments of the planters, with their residences, great sugar mills, refineries, and their necessary appurtenances of shops, stables, warehouses, and the quarters of the numerous laborers arranged in

streets and squares, give these spots continually at first sight the appearance of towns and villages. Here the river is enlivened by the continual passing of steamers and every variety of flat-boats and barges, interchanging the productions of the great valley with those of all maritime and commercial nations. Below New Orleans the scenery presented by the shores of the river is greatly improved, and much of it is tropical in its character. This part of the delta, called the *lower coast*, has been very recently formed by the deposits of the river upon the ancient delta and the bed of the Gulf of Mexico, the shore of which once extended far above New Orleans. It is a narrow strip of land, separating the waters of the Gulf of Mexico, which now approach it under the names of Lake Borgne and Barratieria Bay, and various other bodies of water. It is 110 miles from New Orleans to the mouth of the river, the surface of which at the city is elevated at high water about fifteen feet, and at low water only five feet above the sea level. Numerous bayous connect it with the lakes and bays projected from the Gulf. With the exception of a few low ridges of land upon these bayous, the only portions of the whole area sufficiently elevated for the cultivation of cotton, sugar, corn, vegetables and fruits lie upon the banks. At variable distances, from a half mile to a mile and a half, marshes, covered with cypress forests, or high trees and palmettoes, or tall grass, flags, mangroves and myrtles, separate the cultivated fields from the water of the ocean. As the river projects into the Gulf, the land narrows until it terminates in low, marshy points, covered with reeds and rank water grass and marshes. The forest trees which grow upon dry land, and also the cypress trees and others which occupy the swamps, gradually disappear, until there is nothing to obstruct the view of the water of the Gulf and its bays. The whole of this narrow projection of the delta which borders the river is densely populated and highly cultivated by a greater variety of

races of men than can be found anywhere else on this continent who are not congregated in cities. The large sugar plantations, occupying sometimes several miles of the river banks, are owned by wealthy natives of England, Scotland, France, and of all the older southern and northern States, or by creoles, born upon the lands which they inherited from their French or Spanish ancestors. The residences of the wealthy planters are often beautifully ornamented. Their yards are shaded with large pecan trees, live-oaks, and other varieties of native growth, mingled with others imported. Hedges of evergreen roses, and sometimes of the sour osage, whose beautiful golden fruit hangs upon the tree all the winter, and the Japan plum, which never withers, and prolific and delicious clusters ripen in February and March, with the orchards of sweet oranges and lemons of every variety, and the broad-leaved bananas, give these abodes a very tropical aspect. The houses of many of the descendants of the original emigrants from Spain, France and Italy are built in some places, for miles, close to each other, and a continuous orchard of orange trees, many of them thirty feet high, and forty or fifty years old, partially conceals these primitive abodes from the only public roads they have, and which run with the protecting levees and telegraphic wires directly upon the banks of the river. Some of them are thatched with the leaves of the palmetto, and have growing about them citrons, shaddocks, bananas and fig trees, and there is little about the habitations, or the swarthy skinned inhabitants, different from the aspects of human life in many places of the torrid zone. They are engaged in fishing and hunting, and raising rice and oranges for the New Orleans market. The surface of the river is higher than their abodes and fields; and you can look down upon them, and over all the flat country, from the deck of a steamboat. The equatorial current, which flows against all this lower coast, having a temperature of upward of 70°, warms it

in winter ; while the temperature of the water of the river never falls below 50° in the coldest weather. The moisture and richness of the soil, aided by this mild temperature, makes this last formed part of the earth the most productive. In some years, when the seasons are favorable, as much as three hogsheads of sugar, or 3,600 pounds, are made to the acre, which is a product equal to \$360. I have known 2,200 pounds of rice made upon an acre of this land, and a single hand can cultivate ten acres. As much as \$7,000 have been made by the sale of the oranges from an acre and a half. The monsoon prevents the heat from being oppressive, and the river aids in cooling the atmosphere in the summer. It retains much of the coldness it brings with it from its mountain sources. The only cold weather felt in Louisiana, Texas and Mississippi comes from the north-west, and is caused by what are called "the northers." They do not blow from the north upon these States, but they descend from the north-west, and are produced by the condensation of the air on the snow-covered range of the Rocky Mountains, extending from New Mexico to Alaska. They blow very regularly for three days and nights in succession, whenever they occur between the first of November and the last of March, and are the most intensely cold in mid-winter, when they sometimes, in New Orleans, reduce the temperature to 15° above zero. There is no regularity in their occurrence. Some winters pass away with only one or two, giving the Gulf States only two or six days of freezing weather. I have known only one winter in the last thirty years to elapse without any. Other years were visited by three, six and nine of these Rocky Mountain blasts, making nine, eighteen and twenty-seven cold days, which was the largest number in the same period. In some respects they are positive advantages. They give these southern States all the weather sufficiently cold to enable the planters to salt and pack their meat. When they come early in October

or late in April their effects are very disastrous. They wither all vegetation and destroy the crops. They combine with the south-east monsoon to form the terrific typhoons which sweep the Gulf of Mexico and its shores, and the Atlantic Ocean along the track of the Gulf stream. When these northers blow upon the delta they wither the cane, orange flowers and all tender plants upon the lower coast, not protected by the river. I have mentioned that its water in the winter is comparatively warm; and I have never found it lower than 50° or 60°, below New Orleans. The air in contact with it is reduced or elevated to the temperature. What may be termed the warm "breath of the river" is borne to the south-east by the north-west wind, and gives the plantations, orchards and gardens on both banks, which are situated to the south-east of the river, or to the *leeward* of the norther, a frostless climate. Not a leaf or flower is blighted, and the verdure of spring is perpetual in all these sheltered curves of the river, as it pursues its rapid course on its serpentine path from New Orleans to "the Passes."

The most of this grand and beautiful region, made by the most recent deposits of it, is included in the parish of Plaquemines. On account of its great fertility, and the enormous crops of sugar, rice, cotton and tropical fruit, and the abundance of vegetables, fish, poultry, game and wild fowl, as well as the domestic animals it produces, it is called "the empire parish" of Louisiana. It would be the most desirable of human abodes, but for a number of evils which infest it, and which are sufficient to unparadise any earthly Eden. The hurricanes and cyclones, the malaria, the mosquitoes, deer flies and sand gnats, successively or acting in concert, are perpetual annoyances and often fearful calamities. You have doubtless read many descriptions of the whirling storms which occur most frequently in those parts of the globe where the equatorial currents of the ocean are found. They are most prevalent in the Pacific, where the great

*kuro siwo* or black current flows from the equator and bears its heated waters toward the north-western shores of America, along the eastern coasts of the islands of Japan ; and in the Caribbean Sea, the Gulf of Mexico and the Atlantic, where they follow the course of the Gulf stream. They are also very destructive in Madagascar and the islands of Bourbon and Mauritius, in the track of the Mozambique current of the Indian Ocean. Light winds in Texas, Louisiana and Mississippi veer occasionally from between all the cardinal points, but the prevailing wind, in summer and winter, is a south-easterly monsoon, which comes loaded with moisture from the tropical waters of the Atlantic, Caribbean and Mexican gulf, and deposits nearly all the snow which falls upon the Rocky Mountains. In Texas this sea-breeze blows strongly day and night continually, the year round, only interrupted a few days in each of the four seasons. Whenever this balmy and delightful breeze blows for a time with more than usual force, it deposits an unusual amount of snow upon the Rocky Mountains, which causes a great condensation of the air about its crests. In winter this condensed air, or some ærial obstruction, stops the course of the monsoon, which is succeeded by a calm. The sun, acting upon the semi-tropical plains of this region, rarefies the atmosphere. The barometer falls. The air is thin. A suffocating calm is prognostic and precursor of the norther. The condensed Rocky Mountain air-bank expands, and with clouds, lightning, hail and rain, or in a clear and cutting cold blast, it pours down suddenly from the north-west to fill the vacuum, or to restore the equilibrium of the atmosphere. It presses back the monsoon which meets it from the south-east. A terrible struggle of the winds ensues; not as you have probably read between the south-eastern and north-eastern trade-winds; for, on all the Texan coast, during observations made for more than thirty years, I have found no *north-east* trade-wind but

between the south-east gale and the norther. A typhoon is the result of the encounter, and these destructive storms, when they are thus produced on the Gulf, whirl away toward the north-east, following the lines of least resistance, *the thin and warm air-paths*, made by the Gulf stream, or lying in its direction from south-west to north-east across the Gulf States. The great typhoons, and the lesser whirlwinds, commence at different points on the mainland, and far out at sea, generally somewhere between the island of Cuba and the peninsula of Yucatan and the Rocky Mountains; but, whether they are 500 miles in diameter, or only a few yards, their centers all move from the points where they occur toward the north-east. When the terrible cyclone occurred on the 19th of September, 1854, which destroyed entirely the city of Matagorda, and visited with destruction much of the eastern coast of Texas, and the shipping on the Gulf, I was in the interior of Texas, sixty miles from Austin and about 220 miles due north-west from Matagorda. A furious norther suddenly descended from the direction of Pike's, Long's and the Spanish peaks and blew down my tent, and for three days and nights, including the equinox, made us all very uncomfortable. A large party of old Texan frontier people were encamped at the Lampasas Springs, then in a wilderness. We were enjoying the pleasures of buffalo and antelope hunting, and using the sulphur water, disputing its possession with the Comanches. If you will examine the map, you will find that a line drawn from the south-east to the north-west, and which marks precisely the track of the opposite winds, will touch Matagorda and the Lampasas Spring, and penetrate the loftiest snow-covered chain of the Rocky Mountains, crowned by the gigantic peaks I have mentioned. There was no whirling, raging wind where I was, but three days and nights it swept fiercely on a straight line from Long's peak to Matagorda, where it made a vortex with the monsoon; and for the same time precisely, but



commencing and ending a few hours later, it *whirled* everything to ruin, as it moved to the north-east. Many observations like this, continued for the quarter of a century, have convinced me that the northers of Texas always aid in forming the typhoons of the Gulf of Mexico, and that all the whirlwinds of the south-western and Gulf States are produced by the winds from the Rocky Mountains and the south-east monsoon, which meet each other on the same air-lines, whose general direction is south-east and north-west, and the tornadoes they produce move from south-west to north-east.

But, no matter what may be their cause, they are the most terrible scourges of the lower coast of the Mississippi. The narrow point of land which forms its trough, 110 miles from New Orleans to the Gulf, lies directly in their track, and at intervals of ten or twelve years they sweep over it with destructive force, and inflict damages upon the inhabitants which it requires many years of industry and economy to repair. A description of one of these great storms, which occurred the 10th of August, 1860, as it was observed at one point, sixty miles below New Orleans, will give you a general idea of them all. The levees broken, the plantations injured by being inundated by the salt water of the sea, houses and fences destroyed, orchards blown down and washed away or killed by the salt water, horses, cattle, sheep, hogs and poultry drowned, and individuals and whole families engulfed by the mingled waters of the Mississippi and the Gulf, make some of the items of the last of these terrible visitations of which the inhabitants speak with dread, and from the effects of which many are now suffering.

Elmwood is situated, like all the other residences of the lower coast, upon a higher part of the alluvium, with space between the house and river for a shaded yard, a road, and an embankment to protect it from the high water. A fine orange orchard and garden, a large barn, stables, quarters for the hands, sixty head of cattle, a

large flock of sheep, a fine herd of hogs and an abundance of poultry, and the appurtenances of a well-managed and thrifty rice farm belonged to the owner. The vortex of the storm slowly approached it from the south-west, and wind, rain and terrible lightning with mingled might, for three days and nights, beat upon it. The wind, whirling from right to left, or from the south by the east to the north, forced the waters of the Gulf into Lakes Pontchartrain, Borgne, and all the bays and inlets, and blew the surface of the Mississippi a mile wide up stream. The ocean water soon encroached upon the marsh between the Gulf and the plantation, and gradually rose against what is called "the back levee," constructed to protect it against the stormy waves of the sea. At length, the great breakers rolled over it and swept it away. The billows flowed over the plantation, floating off the fences and all the domestic animals of every kind. The angry waters, covered with drift-wood, upon which the wild beasts and reptiles of the swamps had taken refuge, rushed into the yard and roared against the dwelling. Trees and floating wrecks of out-houses mingled with the struggling horses and domestic animals, vainly battling with the storm for their lives, added to the horrors of the scene. The water rose and pressed against the lower floors of the houses. To prevent them from floating away with their families, some of the planters cut large holes through the flooring and opened the lower doors and windows to admit the wave and add their weight to prevent them from being lifted from their foundations. The wild-cats, raccoons, and, in some instances, panthers and dangerous reptiles, forsook the floating drift-wood and took refuge in the houses that withstood the tempest. One gentleman, in the neighborhood of Elmwood, killed three rattlesnakes that crawled into his porch. More snakes are found in this region than in any other part of the United States; and every variety of reptile in the whole valley of the Mississippi is

abundantly represented here. They hibernate in hollow logs and take refuge upon them in the spring, when the bottoms of the tributaries of it are inundated, and they are floated down to the delta where all this wreck of the forests is stranded by the winds and waves upon the banks of its lower coast and on the Gulf shores about its mouths. The snakes are thus landed in this region, where, with the alligators and other species of animals without number, they multiply incredibly, and change into new varieties. The family of Mr. Cannon, at Elmwood, about thirty persons including his slaves, took refuge in the upper story of his house when the lower was submerged. Heavy logs were driven by the waves, with the force of battering-rams, against the barn, stables and out-houses, all of which were knocked down and floated away, with the fences and with every animal upon the place. A row of large fig trees, which stood between the house and ocean current, remained firmly rooted, and with their thick and strong branches caught the advancing trunks and heavy drift, and prevented them from being hurled against the dwelling, which was the last house left standing. Boats and sailing vessels were useless. No ship could withstand the storm; and some of the families who attempted to escape by that mode were wrecked and drowned, and others disappeared in the tempest and were never heard of again. The water of the river and of the Gulf rose together. At length the great breakers from the Gulf rolled over the front levee and mingled with the river; and the land was entirely buried by the stormy waters, which rolled like the uncontrolled ocean remote from any shore. On the third day of this remarkable typhoon the solitary house containing the family at Elmwood rocked and swayed to the shock of the winds and waves; and when the last whirl of the tempest struck it with a sweep from the north-west, it seemed for a few moments that their final mortal hour had come; but the house remained upon its pillars, and the waters were

driven out, by the change of the blast from the north and west, as rapidly as they had been gathered by its wings when they swept from the south and east. In a few hours the dreadful meteor passed away to the north-east, with all its majesty and awful grandeur, while a radiant rainbow glittered upon the banners of its retreating cohorts of thundering clouds. The trembling family were left alive upon the land, stripped bare of all their property, except the little gathered in a single house, but thankful to the God who had spared them that, with their lives.

I consider these storms, which occur at irregular intervals, as the worst of the ills with which the lower coast is visited. But the soil is so fertile that the planters recuperate from their effects, and many of them become and remain wealthy in spite of them. A mass of logs and vegetable matter, at least 300 feet thick, forms the skeleton of the land; and they bear as large a proportion to the whole bulk of the alluvium as the bones of the human body do to the flesh. The soil contains every chemical ingredient and fertilizing agent that can be found, separately or combined, in all the valleys of its tributaries which bring their contributions from the Ozark, Cumberland, Allegany and Rocky Mountains, and from all the rich cretaceous, magnesian and silicious prairies and wooded regions they irrigate. Red river and the Arkansas flow through a gypsum field east and north of the great staked plain of Texas. This has not been fully explored, but it was traced by Prof. Shumard 300 miles, and was found to be seventy miles wide at its narrowest part, and the layers of gypsum were everywhere fifteen feet thick. This gives the bottoms of the Colorado, Brazos, Red and Arkansas rivers, their marvelous fertility; and the last two streams discharge it abundantly into the Mississippi, to be mingled with the carbonates and phosphates of lime and the charcoal of the burnt prairies brought down by those rivers,

and the Kansas, Tennessee and Cumberland, and all the great and small affluents of the Missouri, upper Mississippi and Ohio. Its fertile alluvium is its mud and all the solid matter rolled down with its water-logged timber upon its bottom and heaped into batture by its eddies. The water itself is absolutely pure and holds little or nothing in solution. A chemical analysis of it, made for the Academy of Sciences, in New Orleans, by Dr. Riddell, proved that when clarified of its mud it is pure as rain-water just fallen from a winter cloud, or that of the coldest spring formed from melted snow. The sulphates of iron and lime, and the carbonates and mineral ingredients of every kind poured into it by a thousand streams, seem to have neutralized each other and fallen to its bottom to enrich its soil, and left the water unalloyed. Of all the filth poured into it from the butchers' stalls and sewers of New Orleans, I do not think a particle could be found in its current a mile below the city. The alligators, alligator-gars, catfish, turtles, shrimps, and voracious fish and reptiles of all sizes, and more than a hundred varieties, devour it all; or it sinks to the bottom and combines with its mud. I prefer it to any other water for drinking. It is said of travelers who have tasted the water of the Nile, that no matter in what regions they may live, they always thirst for it. It is so with those who have become accustomed to drinking the Mississippi. I have often walked a mile through New Orleans, in a sultry summer day, to enjoy an iced draught of it from the *coolers* of the steamboats lying at their landings on "the levee." There is no danger in the delta to be apprehended from earthquakes or famines. Whenever there is an earthquake at New Madrid in Missouri, there is a simultaneous shock at Caraccas in South America, and Sir Charles Lyell thinks that these points are connected by a *lava sea*, which must underlie the delta of Louisiana. But the subterranean wave of fire does not disturb it, and there is no evidence that the

lower coast has ever felt the tremor of an earthquake. This proves that the crust of the earth beneath this semi-fluid and almost amphibious region is very thick and stable. Every bayou teems with fish and wild fowl. The bays are bedded with oysters. The flat prairies and marshes abound in deer and all the varieties of game found in the Gulf States, besides herds of wild cattle and hogs. The Malays and Chinese, and the mixed population engaged in the business of fishing and fowling, make fortunes at it. The river surface is elevated, in the spring and summer, far above their fields. This renders them independent of rain. When they need water, they have only to open their ditches, and close the gates of their back levees, and let all the river flood their fields. After they have covered them with water and saturated them sufficiently, they close their front water gates and open those next to the swamps, and the water runs off and leaves them dry. In speaking of the evils they suffer from typhoons and whirlwinds, I ought, perhaps, to have mentioned the lightning which falls from the small summer clouds with the ordinary showers; and which, in this flat country, is very dangerous. Where there are few elevated objects, it falls upon the telegraphic poles, upon trees, and houses unprotected by Franklin-rods, and is even attracted by the pointed reeds, which are twelve or fifteen feet high, and cover hundreds of square miles of the uncultivated parts of the delta. In the fall, spring and winter the lightnings keep these reed brakes burning continually. I saw six fires kindled in different parts of these prairies within an area of six square miles by the lightnings of a single small thunder cloud, which passed over it in a half hour. They usually continue burning until their course is arrested by the natural bayous or artificial canals, which intersect the lower coast in all directions and render these fierce fires harmless. They are beautiful objects at night, and illuminate

every part of the horizon during the winter with the splendors of many auroras.

Next to the typhoons, the malaria is the most dangerous evil of the delta. Every form of fever prevails in it. Yet thousands are born and live among these swamps and marshes to extreme old age. The wealthy and educated classes of the planters are generally healthy and long-lived, and the youths of both sexes are remarkable for their strength, activity, intelligence and beauty. Refinement, hospitality, politeness and elegance of manners are almost universal among the creole landholders of various nationalities. It is a remarkable fact, that during two years while I had charge of this whole area of one hundred and ten miles as the only protestant minister in it, and visited every part of it at all seasons of the year, exposed to wettings, to heat and cold, night and day, I was not confined by sickness a single day; and although I baptized about fifty persons in Plaquemines parish and other parts of Louisiana, I only buried one. There was some sickness at all seasons, and several deaths from yellow fever; but I happened not to be called upon to perform the funeral service. Usually, where I have baptized fifty, in what are regarded the healthiest parts of our country, I have buried from five to ten. This proves that, notwithstanding the malaria which infests it, the region is not very unhealthy. The greatest annoyance it suffers is from the blood-sucking insects of various kinds. There are no bed-bugs or chinchies in the delta, and I have never seen the black chigger of the West Indies and Florida; but the small red variety is abundant. There are many varieties of mosquitoes, but three of them are almost intolerable pests. The gray variety, which is found upon every spot of the American continent where there are marshes which generate malaria, and which annoyed Captain Franklin even at the mouth of McKenzie river on the shore of the Arctic Ocean, appears in mid-winter on the lower coast, and is always

vigorous and voracious, except when the thermometer in a bedroom is at the freezing point. But they love night and darkness, and are not very troublesome in the day ; and they avoid the heat of the sun. A smaller gray kind is awake, active and blood-thirsty all day, and make reading and writing impossible without the protection of netting. They have the recommendation of biting without singing. But the worst of all the tribe is a short-winged, yellowish variety, which is averse to shade and avoids the interior of houses, and makes its attacks in the hot sunshine and the strong sea-breeze. They alight upon the clothing or naked skin, and cling fast and fearlessly to whatever they catch. They cannot be frightened by a wave of the hand or any threat. To get rid of them you have to *dash* them. Their long bills are slightly curved *outward*, like a sabre, and they deliberately adjust their points, throw the weight of their bodies upon them, pulling with their fore-feet and *spade* them into the skin, which they reach through thick woolen clothing. At some seasons of the year the plowmen are compelled to work with thick gloves upon their hands and veils over their faces, and to cover their mules with a blanket of corn sacks sewed together. The villainous gray mosquito infests portions of the whole continent, and they seem to be as well adapted to endure the severities of various climates as man himself. An insect which can thrive amid the arctic snows at the mouth of the McKenzie, and which feasts with equal delight upon the naked negro and fur-clad Esquimaux, must have a fine appetite and a strong constitution. Even here each one of you is familiar with the ear-piercing shriek of joy uttered by the voracious little pest when *she* smells the blood of an American—I say *she*, for the males never bite. It is difficult to ascertain what work these insects perform in the economy of nature in our world, where good and evil are mixed like tares and wheat in a common field. They are certainly not an unmixed evil. They do not feed exclu-



sively upon *blood*, although they like it. They are as fond of sugar as children. I have seen them so thickly clustered upon a lump of it that they made it look as if it was covered with mould. They also feed upon some matter they find in the mud along the margins of stagnant and putrescent ponds and bayous. I have found them near this foetid water with their bills stuck in the disgusting muck, filling themselves with something, which I hope was *malaria*. If *malaria* is a plant of the *fungus* or *algæ* family, like the *mushroom* or *yeast*, which propagates its species by little *spores*, which fly in the air or float in water like dust, and plant themselves in the human lungs or stomach, and by growing in the blood, feeding upon its *carbon* and acidifying it with *oxygen*, produce fevers and other diseases, as physicians suppose ; if the *mosquitoes* eat these destructive little plants and prevent them from killing us, then they are to some extent benefactors, and they are welcome to a little of my blood, if it kills them.

It would require a separate and elaborate lecture on *entomology* to describe the deer-flies, sand-flies, and other *sanguinivorous* insects of the lower coast, which deserve the penalty imposed by the sacred law : "Who-soever sheddeth man's blood, by man shall his blood be shed." The common spotted-winged, yellow horse-fly, which in all the older States confines its attack mostly to the ears and other parts of horses, is called the *deer-fly*. They swarm in countless multitudes, and assail men as well as beasts in the sunshine and wind. They avoid the interior of houses. The little sand-flies are pigmy mosquitoes, which are the peculiar pests of the lower coast, and especially of the passes in mid-winter. They are peculiarly offensive in the night-time, when they penetrate the ordinary mosquito bar and render sleeping impossible. A netting of finer material, with smaller interstices, is required for protection against these pigmies, whose multitude supplies their want of magnitude.

With this brief notice I will dismiss the whole subject of these buzzing swarms of *she cannibals*, the remembrance of which is very painful to me. I will call your attention to only one more of the animals of this region, and I select it for description from hundreds of its genus, because it reflects some light upon our religion and ancient myths. It is a sting-snake—a *veritable Apollyon*, with a sting in its tail. I have seen two varieties of them, neither of which resemble the jointed snake, a kind of *saurophidian*, or connecting link between the lizard and the snake. There are many varieties of this harmless reptile, each of which has the end of the tail armed with a pointed, horny cartilage. But the two varieties of the sting-snake which I have seen are large and dangerous reptiles, armed with real stings which they thrust out from their sheaths or withdraw, and with which they strike, like the hornet or wasp. They have been found in Pontotoc and Coahoma counties, Mississippi, and in Travis county, Texas. I had two of them in my possession in Austin in 1852. They have also been found in St. Mary's parish, Louisiana, and they are numerous on the banks of the lower Mississippi, in Plaquemines parish. One variety is a shining brown-black reptile, about five feet in length and five inches in circumference when fully grown, with a small head and large neck. Underneath, the body is marked like a *backgammon* board, or *tesselated pavement*, with alternate squares of reddish-yellow and black. While crawling or lying basking undisturbed, the tail looks like that of most other snakes—long and tapering, but slightly blunted at the point; but when it is irritated, it thrusts out a keen black sting two and one-half inches in length, with which it strikes instantly, like the *sting-ray*, with great accuracy and force. The sting is sheathed like that of a bee, but it is not barbed, as the ancient artists painted the tails of the dragon and “the old serpent.” But the serpentine monsters of Grecian myths, with

appendages of stings to their tails, proves that serpents of this kind must have formerly existed in the Old World, as they certainly do now in the New. Another variety was discovered by Judge McGilhenny, upon Avery Island, in St. Mary parish, and was sent by him to the Academy of Sciences, of New Orleans. He found, also, specimens of the black kind, which are of golden-yellow color, banded with jet black splotches, which give it a hideous appearance. But few can look upon this formidable reptile, five feet long and six inches in circumference, armed with a sting two and one-half inches long, strong and keen as a tailor's needle, without a shuddering sensation of antipathy and dread. I described these snakes to Prof. Agassiz in October, 1868, and he told me that he had never heard of them except in the popular legends of the ignorant about *hoop-snakes*, which are based upon the real existence of these reptiles. They are certainly capable of inflicting a mortal wound upon man or beast; yet I have never known a single individual killed or wounded by one; and it is remarkable that, during a life of more than thirty-four years in Mississippi, Louisiana and Texas, where so many venomous reptiles abound, I have the positive evidence of only one person who has died during that long period from the sting or bite of a serpent in either of those States. He was an old gentleman by the name of Duty. He died in fifteen minutes after he was bitten by a rattlesnake, near Austin, about twenty years ago. This proves that the dangers of this region, threatened by such venomous reptiles, are much exaggerated. More persons die from the bites of mad dogs in our large eastern cities than are killed by all the reptiles and wild beasts of the valley of the Mississippi.

## XII.

## THE GEOGRAPHY OF MOUNT SINAI.

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BY MINER K. KELLOGG.

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READ DECEMBER 20TH, 1870.

MR. PRESIDENT : I propose this evening to examine the natural features of the most noted station of the Israelites, in their journeys from Egypt to Palestine, and hope to furnish material for a clearer comprehension of a question which, for many years past, has excited much interest and discussion among biblical scholars and geographers.

This question relates to the existence of a plain in front of the *traditional Mount Sinai*, capable of containing the immense number of Israelites who witnessed the promulgation of the Commandments from the summit.

The assertion and ingenious arguments of those writers and travelers who deny the existence of such a plain, are so strong that the learned Dr. Kitto says, "They are likely to retain their hold upon the public mind for some time to come," and that "the question was raised in America, to which it properly belongs." In this connection he gives the views of Dr. Robinson on the negative side of the question, and then opposes them by a lengthy quotation from an article which I contributed to the New York "Literary World," in February, 1848, and then concludes the chapter with this remark : "Thus it seems that the question of the camping ground of the Israelites, which seemed to have been settled by the researches of Dr. Robinson and others, must now be considered as reopened for further investigations. The fact is, that a

complete and careful survey of the whole of this mountain region yet remains to be taken."

Under these circumstances of the case it is not unnatural that I should embrace the opportunity afforded by the courtesy of this Society to make an effort to solve a question raised, in some measure, by my published statements. To this end I will commence with a brief outline of the general features of the peninsula of Mount Sinai.

This portion of Arabia, so well known by the name of *Arabia Petraea*, is bounded on the north by the Mediterranean, and on the south by the two arms of the Red Sea. The southern district is remarkable for its ranges of lofty, precipitous and perfectly sterile mountains of sandstone, grüstein, porphyry and granite; the highest being granite and reaching the altitude of 8,000 feet, in the neighborhood of Mount Sinai.

The northern district is an extensive plain, barren alike of verdure and water; some parts being covered by coarse sand, and others inlaid with pieces of sharp and pointed flint, many of great size, and so firmly imbedded in a compact surface of limestone debris, and exposing their points in such a dangerous way as to preclude any comfortable repose to the weary traveler. This I state from experience, having passed over the whole expanse of this terrible desert—this *terra incognita*—on my way from Sinai to Jerusalem, a distance of 200 miles; taking, however, a more circuitous and different route, I believe, from almost every modern traveler. A few ruins of ancient cities are to be seen in this region, but their names have not yet been determined.

It was in this great lifeless waste that the Israelitish host wandered for forty long years. Certainly, nothing less than miraculous power could have sustained them in this scorching, arid and desolate wilderness, which offers at this day no sustenance of any kind to any living thing.

Sinai is one of the highest mountains in the peninsula, and is 7,035 feet above the sea, standing distinct from all others; the separating spaces being sharply defined on the east and west by narrow, deep and precipitous ravines. On the north-east it is bounded by the plain, or wady, of *Er-Rahah*, and on the south-west by the plain of *Es-Sebâiyeh*. The mountain itself is about three miles long from north-east to south-west, and about one mile wide.

With this short geographical sketch, the way is prepared for entering upon the particular question which I desire to discuss this evening.

Conspicuous upon the list of those who deny the existence of a plain on the southern border of Sinai, and, consequently, that the southern summit of this mountain is not the true Sinai of Scripture, is Dr. Robinson, the well-known author of "Biblical Researches." This summit is known as *Gebel Musa*, or the Mountain of Moses; of late years it has been designated the *traditional* Sinai, to distinguish it from the northern summit, which many modern authors declare to be the true Sinai, but which has always borne the name of *Horeb*.

Dr. Robinson, on page 153 of the "Biblical Researches," declares that "In the present case there is not the slightest reason for supposing that Moses had anything to do with the summit which bears his name;" "nor is any spot to be seen around where the people could have assembled."

Nine years after the publication of my notes, which controverted this view by giving the measurement and character of an extensive plain beneath *Gebel Musa*, Dr. Robinson issued a second edition of his "Researches," and in the appendix briefly referred to my narrative, and said that my "description of the plain of Es-Sebâiyeh was accompanied by a sketch on wood, which was not only inaccurate but greatly exaggerated;" but did not say wherein it was exaggerated. I presume his only reason was that it contained the plain of Sebâiyeh, this

being the only essential point of difference between his map and my own. The value of his criticism rests, therefore, upon the simple fact whether such a plain actually exists as I have represented it; and on this point I shall adduce corroborative evidence from other sources before concluding this paper. Dr. Robinson, however, reiterated his former opinions and enforced them by giving "reasons for neglecting to examine more particularly the immediate base of Sinai on the southern side," one of which was "the distance from the base to the nearest point where the people could have stood." It is evident that he was unmindful of his former positive assertion that "there was no spot to be seen around where the people *could* have assembled," and it is certain that his logic was at fault in drawing conclusions from the relations or conditions of a thing, the very existence of which he had already distinctly denied.

Lord Lindsay is also on the list of those who deny the claims of the *traditional* Sinai. His lordship preceded Dr. Robinson, and published his "Letters" on Sinai in London, in 1838. In the subsequent edition of 1858, he remarks that, "the honor of the *quasi* discovery of Er-Rahah, and the first identification of it as the scene of the encampment, has been assigned to myself in 1837, and to Dr. Robinson in 1838, as successive, although independent observers." In the first edition, his lordship states that, "there can be no doubt, I think, that the Israelites encamped on the plain Er-Rahah; it is the largest, indeed the only plain in all this district." "There is not space enough in the narrow ravines from which alone the peaks of Gebel Musa and St. Katherine are visible, or in any other plain or valley in the whole district, for the people to have encamped, with such regularity and comfort as it is evident they did."

Notwithstanding these confident opinions expressed in the first edition, Lord Lindsay was disposed to modify them in a note to the later edition of 1858, in which he

observes that "Mr. Kellogg, an American gentleman, who visited Mount Sinai in 1844, states the wady Sebâiyeh to the south of the convent, and of the little Mountain of the Cross (Neja), the same which I have described under the name of Gebel Minnegia, is even more extensive than the Er-Rahah, and more suitable for the encampment of the Israelites. Travelers would do well to explore the region south of the convent. Mr. Kellogg's theory, it will be observed, presupposes the arrival of the Israelites from the south, which is against probability."

I may here remark that this is not alone my theory, but one held by much older travelers. But, even admitting that the Israelites did arrive by a northern route, they could enter the southern plain with even greater facility than the northern, because they would arrive at its very entrance before striking off through wady Es-Sheikh, which leads into the northern plain. This view, therefore, does not *necessarily* presuppose the arrival of the Israelites from the south. Time, however, will not permit me to argue the "probability" of the theory of a southern route, and I pass on to another notable champion of Er-Rahah.

Canon Stanley, in his work on "Sinai and Palestine," says that, "amongst all the pilgrims who visited Sinai for so many centuries, hardly one noticed, and not one paid attention to Er-Rahah; and yet it is the very feature, since the time it was (we may almost say) discovered by Lord Lindsay and Dr. Robinson, must strike any thoughtful observer as the point in the whole range the most illustrative of Israelite history."

In another place it will be shown that Canon Stanley is mistaken in supposing that not one paid attention to Er-Rahah. That it is so seldom mentioned by the numerous pilgrims who have necessarily passed through it, because it was the shortest way to the convent, is conclusive evidence to my mind that it has never been con-



sidered as "the very feature most illustrative of Israelite history." Another reason supporting this view is that from time immemorial the other plain, Es-Sebáiyeh, has been revered as that of the encampment, from which plain alone was visible the very face and summit of the venerated Sinai. At least, this to me appears to be the reason, in the absence of any contradictory evidence, and because it would be inconsistent with probability to suppose that a plain possessing this *essential* advantage in addition to those of greater space and accessibility over Er-Rahah, should not have been the one accepted and revered by pilgrims.

Another remark of Canon Stanley deserves consideration. He says: "With two exceptions, all the old travelers that I am acquainted with, from Fraymensperg, in 1346, to Balon, in 1548, call Gebel Musu, *Horeb*, and Gebel Katherine, *Sinai*. Since that time, or the beginning of the sixteenth century, that hallowed name has reverted to Gebel Musa; reverted, I say, because, from Justinian's time (527) till the beginning of the fourteenth century, the tradition identifying it as Mount Sinai appears to be uninterrupted."

Now, this mistake of those early writers in confounding Gebel Musa with Gebel Katherine may be accounted for by the fact that these were supposed to be one and the same mountain. This fact I glean from Sir John Mandeville, who endeavored to correct the mistake as early as 1322. In speaking of St. Katherine, Sir John writes these words of caution to his Christian readers: "Although the collect of St. Katherine says that it is the place where our Lord gave the Ten Commandments to Moses, and where the blessed virgin St. Katherine was buried, we are to understand that it is the same country, or in a place bearing the same name, *for both hills are called the Mount of Sinai*; but it is a great way from one to the other, and a great deep valley lies between them." Sir John, having written the above a whole cen-

tury before the invention of printing, his instruction could have but little effect; but we notice that after this invention made it more generally known, the error was corrected, and the "name of Sinai *reverted* to Gebel Musa," which held it again "uninterruptedly" until the second period of geographical confusion, which commenced in the early part of the nineteenth century—that is, about 1820; at least I cannot trace it to an earlier date.

In Conder's "Popular Description of Arabia," page 178, published in London about 1820, will be found these words: "In the names of Djebel Musa and Djebel Katherine, so incongruously associated, we have a pretty strong proof that the modern Arabic appellations are not to be depended on. *At the risk of upsetting the implicit faith of centuries*, and drawing down upon ourselves the anathema of the whole brotherhood of Mount Sinai, we must intimate the doubt we entertain whether the Mountain of Moses be the Mount Sinai on which the law was given to Israel. Burckhardt has given a description of another still more elevated summit, which seems, at least, to put forth rival pretensions—Mount Serbal." From this we might infer that the writer was supported by Burckhardt in the doubt he risked so much to "intimate." Let us then look to Burckhardt's exact words, which are these:

"It will be recollected that no inscriptions are found either on the Mountain of Moses or on Mount St. Katherine. \* \* \* From the circumstances, I am persuaded that Mount Serbal was at one period the chief place of pilgrimage in the peninsula, and that it was then considered as the mountain where Moses received the tables of the law, though I am equally convinced, from a perusal of the Scriptures, that the Israelites encamped in the upper Sinai, and that either *Djebel Musa* or Mount St. Katherine is the real Horeb."

To Conder, therefore, may be attributed the honor, if such it be, of originating a geographical problem, which

has ever since perplexed the minds of Bible students, as to the actual position of Mount Sinai. Dr. Durbin is another strenuous advocate of Dr. Robinson's theory. In his "Travels," published in 1843, he says:

"After a careful scrutiny of the whole field of vision, we were fully convinced that there was no plain adjoining Gebel Musa, or even near it in this part of the Horeb group, where the Israelites could have encamped and *seen* the giving of the law under the conditions of the Pentateuch. \* \* I am surprised beyond measure that any affect still to consider Gebel Musa the true Sinai. \* \* It seems hardly possible that any sane man could visit the localities and doubt the accuracy of his (Robinson's) conclusions."

Other distinguished writers might be quoted as proving that the *traditional* Sinai meets with very able and candid opposition. Previous to Lord Lindsay's "Letters" scarcely any author expressed a doubt of the truth of the ancient tradition. It is only since what is termed the *discovery* of a plain before the northern extremity of the mountain, that a persistent attempt has been made to fix upon that extremity as the scriptural Sinai.

It will be interesting and profitable, in this connection, to investigate this claim to the discovery of Er-Rahah, or the northern plain. You may remember that Canon Stanley asserted that, "among all the pilgrims who visited Sinai for so many centuries, hardly one noticed and not one paid attention to Er-Rahah." In order to correct what I stated to be an error of this author, I will introduce a few sentences from that distinguished traveler, *Pococke*, who wrote a description of this plain *just one hundred years* before either of the authors alluded to by Canon Stanley—that is, in 1743. It will, then, be acknowledged that the discovery alluded to is not to be attributed to *any* traveler of the last 100 years, at the least.

Pococke considered Gebel Musa to be Sinai, and the

northern summit Horeb, which is agreeable to tradition ; nevertheless he believes *Er-Rahah* to be the plain of the encampment, though Sinai is invisible from every part of it. He thus describes this plain :

“To the west and south of Sinai is a narrow vale, called the vale of Jah—that is, the vale of God. The vale to the west is certainly Rephidim. \* \* \* Here they show the rock which they say Moses struck, and the waters flowed out. \* \* \* This vale of Jah does not extend the whole length of Mount Sinai and Horeb to the north, but opens into a plain near a league over every way, which is called the vale of Melgah. This, also to the north, opens into the vale of Rahah, which is to the west of the vale of the Convent that is between Horeb and Mount Episteme (*wady Shu'eib, on my map, K*). These two vales of Melgah and Rahah I take to be the desert of Sinai, into which the children of Israel moved before Moses was called up into the mount, and they remained here about two years. It is to be observed that the summit of Sinai, where God gave the law, is not to be seen from either of them, and from very few places ; not from any that I could observe to the north or north-west, being hid by Horeb.”

In these sentences of the old author is an exact description of the northern plain of *Er-Rahah*, though obscurely expressed, and it is something remarkable that Dr. Robinson should have omitted it from among the many other passages which he quoted from the same chapter in Pococke's book. Indeed, it has not even been alluded to by any of the writers who have endeavored to change the traditional localities of this renowned spot. Dr. Robinson goes so far as to assert that “no traveler has described this plain, nor even mentioned it, except in a slight and general manner,” an assertion that called forth a bitter retort from Laborde, the eminent French author and explorer, who had not only noticed the plain, but introduced an engraving of it in his “*Voyage in Arabia*

*Petræa*," published in London in 1838, in advance of Dr. Robinson's work, and which, together with a large map of Sinai, Dr. Robinson announces that he was supplied with, and frequently refers to in the introduction to his own extensive volumes on the Peninsula of Sinai.

Before leaving the plain of Er-Rahah, which has obtained notoriety only within the last thirty years, and that the surrounding valleys of the holy mountain may receive proper elucidation, I will briefly state the result of Dr. Robinson's investigations, as being all that is required at present.

Of Er-Rahah, Dr. Robinson says :

"We measured across the plain where we stood, along the watershed, and found the breadth to be at that point 2,700 English feet or 900 yards, though in some parts it is wider. The distance to the base of Horeb, measured in like manner, was 7,000 feet or 2,333 yards. \* \* \* We may, therefore, fairly estimate the whole plain at two geographical miles long, and ranging in breadth from one-third to two-thirds of a mile, or as equivalent to a surface of at least one square mile. This space is nearly doubled by the recess so often mentioned on the west, and by the broad and level area of wady Sheikh on the east, which issues at right angles to the plain, and is equally in view of the front and summit of modern Horeb."

The above estimate of Dr. Robinson gives but two square miles for the encampment of the Israelites, numbering nearly 3,000,000 persons, and for all their flocks and herds. These are the confined limits of the northern plain. The southern plain of Sebâiyeh will now be described from notes taken on the spot by myself in 1844, and published in the New York "*Literary World*," in February, 1848 :

"On the 6th day of March, 1844, my two companions set out from the convent at Mount Sinai for the purpose of ascending the Mountain of Saint Katherine. I declined going with them, partly through indisposition and partly because I thought I could spend the day more usefully

and agreeably in making some sketches in the neighborhood of the convent. After my friends' departure with the guides, I took a little Arab boy with me to carry my sketch-book and water bottle, and walked up wady Shu'eib, until I came to the little Mountain of the Cross (Neja), which almost shuts up the passage into wady Sebaíyeh, and where I had, for the first time, a view of the southern face of Mount Sinai. Here opened an extended picture of the mountain lying to the south of the Sinaite range, for I was now some 300 feet above the adjacent valleys. After much difficulty, I succeeded in climbing over immense masses of granite to the side of the Mountain of the Cross, which I ascended about 500 feet on its south-western face, in order to obtain a good view of the peak of Sinai which I was anxious to sketch. Here, close at my right, arose almost perpendicularly the Holy Mountain, its shattered pyramidal peak towering above me some 1,400 feet, of a brownish tint, presenting vertical strata of granite, which threw off the glittering rays of the morning sun. Clinging around its base was a range of sharp, upheaving crags, from one to two hundred feet in height, which formed an almost impassable barrier to the mountain itself from the valley adjoining. These crags were separated from the mountain by a deep and narrow gorge, yet they must be considered as forming the projecting base of Sinai.

"Directly in front of me was a level valley, stretching onward to the south for two or three miles, and inclosed on the east, west and south by low mountains of various altitudes, all much less, however, than that of Sinai. This valley passed behind the Mountain of the Cross, to my left, and out of view, so that I could not calculate its northern extent from where I stood. The whole scene was one of inexpressible grandeur and solemnity, and I seated myself to transfer some of its remarkable features to the pages of my portfolio.

"I remained at work until nearly sunset, when I dis-

covered people coming toward me through the dark ravine between the Mountain of Sinai and the craggy spurs which shoot up around its base. I feared they might prove to be unfriendly Arabs, but as they came nearer I discovered them to be my companions and their guides, who were returning from Mount St. Katherine. As the shades of evening were approaching, I shut up my portfolio, and, descending the hillside, joined my friends, and we returned together to the convent. After dinner they desired to see what I had done during the day, and my sketch-book was opened to them. They remarked, on seeing the drawing I had made, that as there was no plain on the southern border of the mountain, I might as well have left out the one seen in the drawing. After my assurance that I had copied what was before me, they laughed, and remarked that none but a painter's imagination could have seen the plain in question, for they had passed entirely round the mountain that day, and could assert *positively* that there was no such plain. Here was a difference of opinion certainly, and one that I did not relish much, as it might at some future time be the means of creating a doubt as to the faithfulness of my Eastern drawings. I begged them, therefore, to accompany me the next day to that side of the mountain and be convinced of what I had told them. They remarked that all authority was against me, and time was too precious to go over the same ground twice. The evening was spent in reading upon the subjects which had occupied our time during the day. Among other works were the 'Biblical Researches' of the learned Dr. Robinson, which had now become almost the only hand-book of the East, and deservedly so, on account of the extensive information upon the topography of the regions treated of; the vast amount of historical truths brought together in an instructive order; and the knowledge now first imparted concerning the different nomadic tribes inhabiting the peninsula of Sinai. On

turning to p. 176, vol. 1, of the 'Biblical Researches,' I was surprised at finding the following remark: 'Even to the present day it is a current opinion among scholars, that no open space exists among these mountains.' \* \* \*

"The next morning, March 7th, I prevailed on one of my companions (Mr. A. B. Ackworth, of London) to accompany me to the plain in front of *Gebel Musa* (Mt. Sinai), and the following extract from my journal will give the result of our investigations: '7th March.—Spent in wady Es-Seba'iyeh, or the plain before Mount Sinai. Ascended wady Shueib from the convent to the Mountain of the Cross (*Gebel Neja*), and passed the high neck which joins it to *Gebel Deir*; descending, with great difficulty, a very precipitous gorge into wady Es-Seba'iyeh, we took our course along the base of *Gebel Deir*, until we came to a point whence the peak of Sinai was no longer visible, because of the intervening point of *Gebel Deir*; then striking across Seba'iyeh to the right, keeping Sinai in view, we stopped to contemplate the scene. Here the plain is very wide, and forms one with wady Sedout, which enters it from the south-east at a very acute angle, and in the whole of which Sinai is plainly seen. These two waddies made a width of at least the third of a mile. The hills rising from the east and south of Seba'iyeh, in front of Sinai, are of gentle ascent, upon which flocks might feed, and the people stand in full view of Sinai. For many miles, perhaps six or more, on the eastern border of this plain, are seen many small plains high up among the hills, from all of which Sinai is plainly visible. Near where we stood, a high, rocky platform of granite arose from the plain, upon which I seated myself, and took a sketch of the valley to its junction with wady Es-Skeikh on the north, where stands *Gebel Fureia*, a very conspicuous and singular mountain. At this point wady Skeikh turns from its eastern course after leaving wady Rahah, and runs north around *Gebel Fureia*, where it receives Seba'iyeh from the south,



and with it forms one level and unbroken plain for about twelve miles to the north of the place where I was seated. Turning back now to the south, we traversed the plain toward the base of Sinai. The wady grew narrower as we approached Neja, the base of which projected far into the plain, and its head shut off the view of Sinai for a distance of about one-half the width of the plain at its base. As we passed its foot Sinai again appeared, and we measured the plain near the pathway which leads up toward Sinai on the southern border of Neja, and which appears to be the only entrance to the Holy Mountain.

“The measured width here was 430 feet. Passing on 345 paces, we arrived at the narrowest part of the plain, some few yards narrower than where we had measured it. This may be considered as an entrance door to the plain which lies directly in front of Sinai, and which now spreads out level, clean and broad, going on gently ascending ground to the south, with varied widths for about three miles, where it passes between two sloping hills and enters another wady which descends beyond, and from which it is most probable, Sinai may yet be clearly seen. .

“On the east, this plain of Seba'iyeh is bounded by mountains having long, sloping bases, and covered by wild thyme and other herbs, affording good tenting ground immediately fronting Sinai, which forms, as it were, a grand pyramidal pulpit to the magnificent amphitheater below. The width of the plain immediately in front of Sinai is about 1,600 feet, but further south the width is much increased, so that, on an average, the plain may be considered as being nearly one-third of a mile wide, and its length, in view of Mount Sinai, between five and six miles. The good tenting ground on the mountain sides, mentioned above, would give much more space for the multitude on the great occasion for which they were assembled. This estimate does not include that part of the plain to the north, and wady Es-Skeikh,

from which the peak of Sinai is not visible, for this space would contain three or four times the number of people which Seba'iyeh would hold.

“‘From wady Es-Seba'iyeh, we crossed over the granite spurs, in order to pass around the southern border of Sinai into wady Lejah. These spurs are of sufficient size to have separate names among the Arabs.

“‘Around them were generally deep and ragged gorges and ravines or water-courses, the sides of which were formed of ledges of granite, nearly perpendicular, of a pink color and fine texture. There are no gravel hills, as mentioned by Dr. Robinson, but a series of low granite hills, much broken up and of different colors, principally of a greenish gray and brown. The plain is covered with a fine *débris* of granite.

“‘Whilst crossing these low hills, my friend pointed out the path between them and Sinai, in the ravine through which he had passed yesterday, on his return from St. Katherine, and it was seen that no plain would be visible from any part of it, owing to the height of the spurs which separated the ravine from Seba'iyeh, and we concluded that most travelers had been led into false views concerning this part of the mountain, from having taken the same path, and hence it was that no account had been given respecting the plain of Seba'iyeh. This ravine around Sinai becomes a deep and impassable gorge, with perpendicular walls, as it enters wady Lejah, passing through the high neck connecting Sinai with the mountain on the south. Descending into Lejah, under the rocky precipice of Sinai, we found the wady narrow, and choked up with huge blocks of granite, which had tumbled from the sides of the adjacent mountains. We could now see the olive grove of the deserted convent of El-Arbain, situated in the bottom of the narrow valley. Passing through this garden, we found a fine running stream of crystal water, of which we partook freely, for our thirst was great. The garden was walled, and

well irrigated by many small canals, but nothing seemed to flourish but the olive. Continuing down the valley, amidst loose rocks of granite, upon some of which were inscriptions in Sinaite, Greek and Arabic characters, and enjoying the wildness of the scene, and the gloomy grandeur of the lofty mountains of naked rocks which almost overhung our path, we saw Horeb on our right, and soon entered upon the plain before it, called wady Rahah. After taking a sketch of Horeb, as the sun was setting, we made our way to the convent, to pass the night within its hospitable walls. Thus was completed a walk around the whole Mountain of Sinai.'

"I have drawn out a kind of map from my notes, by which you will be better able to comprehend the foregoing extract. Although inaccurate, it may answer our purpose."

The foregoing account of the plain Seba'iyeh, I believe, was, at the time it was published, the most minute and yet the fullest description which had been given of its extent, its shape and its physical character, and its relative position to Gebel Musa. And the views presented this evening, enlarged from my original drawings, are the only illustrations I have yet seen of the Mountain of Sinai and the Seba'iyeh plain beneath it. I make no claim to discovery, however, for this would be preposterous, since it was noticed by Dr. Shaw in 1722, and Burckhardt in 1816; though at the time of my exploration I knew nothing of their writings—a state of ignorance quite excusable in an artist, since neither Lord Lindsay, Dr. Robinson, nor any other modern traveler or author, has ever alluded to them. Those earlier authors just named agree entirely, so far as their notices extend, with my own observations. And however imperfect or exaggerated the map may be which accompanied my published notes, it is still accepted as useful and authentic. An exact copy of it, though without acknowledgment, may be seen in the Rev. Lyman Coleman's "Text Book of Biblical Geography." The author, however, has written

to me to say that in future editions of that work the oversight shall be corrected. In his communication he adds the following remarks :

“In my private judgment I fully accepted your theory. I was at Sinai in 1857, and spent three days in a study of this question, walking over all these plains and timing my walks by my watch, in company with a highly intelligent gentleman. I dissent entirely from Dr. Robinson, and only differ from your views by supposing the ‘*whole mount*’ to have been occupied by the tokens of the Divine presence.”

I have already alluded to Laborde as having anticipated, by many years, the so-called discoveries of Lord Lindsay and later travelers, in regard to Er-Rahah, and in fixing upon it as the plain of the encampment. It is but justice to this great writer to state that he subsequently changed his opinion and became the first of all to support the claims of the plain of Seba’iyeh against cotemporary authors with whose views he had formerly agreed. In the appendix to a work entitled “Commentaries upon Exodus and Numbers,” issued in Paris in 1841, Laborde says that he delayed its publication in order to notice Robinson and Smith’s “Sinai and Palestine,” and some other works which had just then appeared. In speaking of Sinai and Seba’iyeh, his corrected opinions are thus expressed :

“The people encamped and united in the southern plain. \* \* \* I believe it to be impossible to find, in archæological researches which propose to fix the localities of the battles of antiquity or the events of our history, so complete a union of coincidences. And we will add, that the world does not produce a scene so grand as Sinai, viewed from the bottom of wady Seba’iyeh ; a mountain of such altitude, cut thus to a point in a way to afford a view of its summit at so short a distance.”

About the time I was preparing my notes in New York for publication, there appeared in Berlin a work by F. A.

Strauss, entitled "Sinai and Golgotha," 1847. The author gives a very graphic account of his examination of Seba'iyeh. Being totally ignorant of each other's views, it is astonishing how nearly we approximated both as to measurements and topography, and to the general character of the scene. He did not go around Gebel Musa, but confined his investigations to the plain, commencing at the base of the mountain and going north to wady Sheikh, which he says "forms one vast valley with Seba'iyeh, the merging of the two being so little marked that in the darkness which had fallen we did not detect it. \* \* \* Saba'iyeh ought to be represented as of the same breadth which Dr. Robinson assigns in his map to Es-Sheikh." He considers rightly the Er-Rahah plain "only an arm" of this vast valley. His conclusion is "that, in respect to magnitude and general grandeur of effect which result from height, there is no comparison between Sinai with its plain on the south side, and Horeb with its plain on the north."

Other writers have, within a few years, given similar testimony in favor of Seba'iyeh and the Sinai of tradition, but I consider it unnecessary to quote them here, and I will detain you only a short time longer by some very pertinent passages from very capable and distinguished authors relating to this subject.

Carl Ritter, the illustrious German geographer, says: "It is to be hoped that other observers will soon thoroughly inspect the whole topography of Sinai, that we may have a more exact map of the locality, which is the more to be desired, inasmuch as both Laborde's and Robinson's are defective in relation to the wady Seba'iyeh, and Robinson's in relation to the *plain* of Seba'iyeh as well. \* \* The explorations of later travelers have cleared up the whole difficulty, and have shown that not alone on the *north* side of Horeb lies a plain large enough for the encampment of so mighty a host as Israel, but that on the *south* side of the mountain there is one no less large, into which the broad and spacious wady Seba'iyeh leads

from the wady El Sheikh ; and that before this vast plain the mighty pyramid of Sinai towers just as visibly as the Ras Sussafeh in sight of the plain Er-Rahah, for which no tradition declares its testimony." The author here speaks of the wady as distinct from the plain of Seba'iyeh, when in reality they are one and the same extended valley.

Dr. Kitto, in his "Daily Bible Readings," a work several years later than the "Scripture Lands," again inserts the substance of my narrative, with these observations upon it :

"It would appear that those who in older times looked upon Gebel Musa as the Mount of God, were by no means so blind to circumstances and probabilities as travelers in their own imperfect information have imagined ; and now that it has been shown that the want of a camping ground, which alone created the desire to give a different locality to Sinai, does not exist, there appears no good reason why the despised mountain should not have its ancient and crowning glory restored to it. It is probable that no stronger instance has occurred to show the necessity of the utmost caution, and the most assured data, in disturbing the established conclusions in matters of this nature, and which may have been founded on circumstances existing, though hidden from us. \* \* Mr. Kellogg accounts for the mistake of previous travelers by showing that, by the *path usually* taken, this important valley of Seba'iyeh is shut out from view by the spurs in front of Mount Sinai."

Here end the evidences which I proposed to offer in support of the *Sinai of tradition*. It is not a tradition originating with monks, as some writers have prejudiced the question by asserting, for it had existence before any religious orders were established, as we know from Josephus' description of the mountain. Indeed, its origin goes far beyond our knowledge. It is sacred alike to the Hebrew, the Christian and the Mohammedan. But

we may soon look for an authentic report from a corps of scientific men who are, I believe, now engaged in a thorough survey of the disputed district, at the instance of a society in London ; a report which, I trust, will forever put to rest this vexed question.

Before concluding this paper, I desire to say a few words upon the religious prejudice which, I think, has had much to do in originating this whole dispute.

The desire to harmonize the acknowledged facts of physical nature with the literal sense of the Scriptures is ardent with most Christian philosophers ; but the progress of science is continually presenting formidable arguments in opposition to their labors and their hopes. This apparent conflict of science with revelation has been of great advantage to infidels and skeptics in their warfare against the Divine Word ; a warfare which will probably continue to trouble the Christian church so long as it has no fixed interpretations of the prophecies of the Old and the parables of the New Testament. The traveller, however, should, if possible be free from the prejudices engendered by this conflict, in his explorations of scenes he intends to describe. His only safe rule would seem to be to receive the Mosaic record of the great Hebrew deliverance from Egypt as a stupendous miracle ; not to be understood at all by confounding it with the known laws of physical science, or with natural facts ; for this would only result in ensnaring the judgment in a network of confusion and doubt. The explorer thus enthralled can make little progress either in historic, scientific or religious investigation.

Beyond the general landmarks, such as Egypt, the Red Sea, the Wilderness, Sinai and Palestine (to which a spiritual signification is attributed by all religious denominations), there is much recorded in the memorable march of the Israelites that cannot, it seems to me, be reconciled to the law governing the human senses, nor with those of time and space. To uphold the letter of

the text strictly would be to put in doubt the entire story of Moses regarding the Israelites. May it not be that the numbering of the tribes and other incidents of the Mosaic record involved another and more important sense that the literal, just as the chronology of the earlier books of the great lawgiver are now admitted to do. If so, it would relieve the question of many difficulties.

These reflections were forced upon me in all my wanderings throughout the Wilderness and the Holy Land; and they were strengthened by a conversation with the learned Dr. Keith, at Jerusalem, in 1844, on the occasion of a general meeting of missionaries to the Holy Land.

Dr. Keith zealously upheld the opinion that prophecies concerning the destruction of Solomon's temple had been fulfilled to the letter. But when it was suggested in reply, that there still remained *many* stones in that structure which had not been overthrown, he admitted the fact, yet still sustained his opinion by remarking that "*enough* had been overthrown to fulfill the spirit of the prophecy."

Now, it is this very *necessity* of a compromise between the spirit and the letter which opens the way to skepticism and prevents a careful and successful examination of the supposed localities of events related in Scripture. To my mind, no compromise is necessary; the spirit and the letter are one, and when their unity is unseen, it is because we do not comprehend the nature of their union. This, however, is not the occasion for discussing this point, though it is of interest and importance; its introduction here is solely to indicate what I believe to be the cause of the difficulty, which oftentimes leads the minds of explorers and scholars into labyrinths of mystery, and disappoints their hopes of important discoveries in sacred fields.

The results of abandoning ancient tradition without just cause must, from what has already been shown, so confuse the Bible student that he cannot be instructed by a



vivid conception of the localities of those marvelous transactions which attended the promulgation of the Commandments. It is, moreover, a censurable thing to overthrow, without good and pressing reasons, a tradition venerated for many centuries, not alone by Christians and Hebrews and Mohammedans, but also by the poor wandering Bedouin children of the desert, whose simple and abiding faith in a heavenly Father is not derived from any written creed, but implanted by the oral teachings of the patriarchs of their race, and renewed from day to day by those memorable traditions that point out those very places in their own silent wilderness which the Almighty had chosen for the glorious manifestations of His Divine goodness and power.

## XIII.

REPORT OF THE RECEPTION, BY THE AMERICAN GEOGRAPHICAL SOCIETY, OF CAPTAIN HALL AND HIS OFFICERS, PREVIOUS TO THEIR DEPARTURE FOR THE ARCTIC REGIONS, HELD JUNE 26TH, 1871.

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INTRODUCTORY ADDRESS OF THE PRESIDENT.

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It is proper that I should say, ladies and gentlemen, in receiving Captain Hall, that the whole merit of getting up this expedition is due to him alone. It was his unaided efforts at Washington which have resulted in the expedition which he is about to undertake, and which will leave here to-morrow or the day following. I hope that the same indomitable energy which enabled him, single-handed and alone, to succeed in getting up this expedition, will be attended by still more auspicious results in his efforts to reach the Pole. (Applause.) He is undertaking a task of very great difficulty. He proposes to first make the attempt by Jones' Sound. After the great difficulties which Sir Edward Belcher had to encounter in that direction, from the powerful current he met and the great accumulation of physical difficulties, we hope that the indomitable energy of Captain Hall and his gallant associates will enable them to discover more than was accomplished by the distinguished English commander. Captain Hall also proposes to try the further route by Smith Sound; but I propose, when we adjourn to the next room, where we have a large polar map, to ask Captain Hall to point out, for the benefit of those present, the exact route he proposes to take. The peril to be encountered is very great. The physical diffi-

culties have proved too many and serious, heretofore, for any expedition. He proposes to make the great journey to the Pole, if it can be reached, from the furthest known explored point, where our countrymen, Dr. Hayes and Dr. Kane, arrived at, a distance of 500 miles, by sledges, so far as the ice will admit, and by water, if water should intervene, requiring a journey by that element. He hopes to overcome the difficulties which carried Captain Parry far southward, by taking a more easterly direction. It may be asked, ladies and gentlemen, what object is there in reaching the Pole? A very distinguished scientific man of England said, the other day, in a public lecture, in reply to the question, "what is the use of science?" that the best illustration he could give was the answer that Dr. Franklin returned when some person asked him what was the use of his discovery in respect to the lightning. The answer he made was, "Tell me what is the use of an infant; make it of use!" And this distinguished lecturer followed it up by a much more significant illustration, saying that when Volta ascertained that the dead frog's leg would move by the application of two metals, a secret of nature was discovered which led, by a legitimate train of investigation, to the discovery of the electric telegraph. We do not know, and cannot estimate in anticipation, the consequences that will result from a more accurate knowledge of our globe. Columbus found very few who would sympathize with him, or who perceived the utility of the effort on his part to go out into the unknown waste of waters beyond the Straits of Gibraltar, in pursuit of a new country. Who can, at this time, estimate the important advantages which have followed upon that successful adventure! If, now, it should be possible to reach the Pole, and possible to make accurate observations at that important point, from the relation which the globe bears to the sun and to the whole stellar universe, the most important results are very likely to follow in a

more thorough knowledge of our own globe; results bearing upon one of the most important of principles—magnetism; not only the laws of revolution of our globe, the laws of life, the laws of vegetation, a law that seems to pervade everything that pertains to the surface of the globe, and even to the interior, to say nothing of the important bearing of it upon a science yet in its infancy, the science of meteorology, the science of the atmosphere, the great influence which is the cause of life and vegetation, and the untold influences which result in the general welfare of mankind.

Ladies and gentlemen, if we stop for a moment to reflect upon the great advantages which we enjoy at present in civilization, in everything that we enjoy, our habits, comforts, business, everything that is elevating to us, we would be astonished to find how large a portion of them can be traced to the slow and patient investigation of some scientific discoverer, who patiently unfolded the truth which led to developments which we are reaping the full advantage of. There is no scientific inquiry which we can ever estimate what the results might be, but, taught by the whole experience of the past, taught from everything that has been known from the beginning of civilization, is of the highest importance to make true acquisitions to our knowledge; and there is no branch of our knowledge so important as a knowledge of the great planet which we inhabit. We have, within the last three or four centuries, achieved enormous results in the acquisition of that knowledge; much remains to be known; and one of the most important things to be known is the Pole.

You are sitting to-night, ladies and gentlemen, in the presence of those brave men, and this northern woman and her husband, who are going to make this perilous attempt in the cause of science and of mankind. You have honored the enterprise by your presence, and I have no doubt they will vindicate it as far as possible by all the energy with which they and their commander will

this investigation. You have before you, to-night, in the presence of Mr. Morton, the only man with Captain Parry, who has seen what possibly may be the open polar sea: at all events, one of two men who has seen water further to the northward than any man before his time. He feels sufficient interest in this expedition to go out upon it, and I hope that he may succeed in reaching that sea, and in exploring it. We have also the presence to-night of Mr. Bessels, who has recently arrived from Hammersfest, on the Arctic. I shall take pleasure in introducing him to the Society in the adjoining room, and he will perhaps say a word. We have also the presence of our friend Mr. Pavy, who, on the 6th of July, will go out on another expedition in the hope of reaching the Pole by the way of Behring Strait. I gave a somewhat lengthened account at the last meeting, Mr. Pavy being present, too modest to speak, of the expedition which he proposes to make, but I will say, at all events, that Captain Hall and his companions will attempt it in the eastward, and Mr. Pavy on the 6th of July in the westward. Mr. Pavy, though living from an early period of his youth in France, is, like Captain Hall, also an American, born in this country; so we will have two American explorers emulating each other in the attempt to add to the acquisition of human knowledge in this perilous experiment of traveling to the Pole. I will now, ladies and gentlemen, as the adjoining room is not as crowded as this, take the liberty of asking our guests to walk in there, and there I will ask Captain Hall to point out on the large Arctic map which covers the end of that room, the route he proposes to follow.

#### ADDRESS OF CAPTAIN HALL.

LADIES AND GENTLEMEN, MR. PRESIDENT AND MEMBERS OF THE AMERICAN GEOGRAPHICAL SOCIETY OF NEW YORK: If I were asked my choice whether I would speak to you to-night, or make a sledge journey to the North Pole, by all means I would take the latter. It is expected

of me that I will do everything ; will commence to agitate the people, and make the North Pole subject popular, and then go to Congress and apply for an appropriation ; then to select every man of the expedition ; next to determine every detail from first to last, and then to come here to New York and make an address before one of the most learned societies of our country, and one of the most important of the world.

I need make no apology, for I have made not the least preparation to appear before such an audience. I am overwhelmed with calls from every direction. My duties to the expedition which I have the honor to command are many, and I know not how it is that I am able to stand here to-night to attempt to address you.

In the fall of 1869, I returned from an expedition of five consecutive years in the Arctic regions, as many of you well know. Those five years were spent in determining the fate of Sir John Franklin's party. On my return I commenced to get up an expedition in search of the North Pole. My idea was that I could become the salvation, as it were, of some of Sir John Franklin's expedition, thinking I would find some of them living among the Esquimaux. I found there were none living, and I therefore returned to the States, and at once commenced the agitation of the subject of getting up an expedition, the object of which was to reach the North Pole. In February, 1870, I landed in Washington. Almost my first call was upon the President of the United States. I detailed to him my plans, and the interview resulted in encouragement ; and that encouragement carried me on and on, and the result is that the expedition is now ready, or about ready, to go to the North Pole. From the President I called upon the Congressmen, republicans and democrats. The encouragement that I received from all was overwhelming, and I must say to you here to-night, speaking the truth, that never in my life did I believe that there were so many good—glorious

good—souls as I found there in the Congress of the United States. You have no idea of the tasks they perform—of their incessant labor.

As I said, I received great encouragement from the President of the United States. He gave me leave, after fully investigating the subject, to use his name as being interested in the expedition and would like to have the question of the North Pole solved. The area surrounding the North Pole, ladies and gentlemen, consists of no less than 2,500,000 of square miles; almost equal to the United States proper. I have devoted no less than twelve years to the object of investigation in the Arctic Ocean. Many who have written to me, or who have appeared to me personally, think that I am of an adventurous spirit and of bold heart to attempt to go to the North Pole. Not so. It does not require that heart which they suppose I have got. The Arctic Region is my home. I love it dearly; its storms, its winds, its glaciers, its icebergs; and when I am there among them, it seems as if I were in an earthly heaven or a heavenly earth. The numerous letters that I have received, from time to time, from various parts of the country, show to me how interested men are in the subject of the investigation or discovery of this part of our globe. If I were asked, is it possible for a man to reach that point of our earth? I should answer yes. I believe I have done the greater part of the work of reaching there, to wit: I have got the means to go there from a liberal government; and if there is anything wanting, it will be my own fault. I supposed, being a civilian, I would be met with a cold shoulder by those belonging to the navy. The statute was so passed that the money appropriated for this expedition was put into the hands of the President. The President, after appointing me commander, turned me over to the Secretary of the Navy, the Hon. George M. Robeson; not that he is a republican, but a man of the world. I almost worship him. Not one requisition that I have made of him, in

reason, has he refused me. He asks me what I wish ; what will contribute toward the success of the expedition ; I tell him, and it is at once forthcoming.

But a moment before I left Brooklyn and my favorite "*Polaris*," I was waited upon by the commandant of the navy yard, who told me if there was anything more wanted, to name it. I told him what I had, and thanked him in the name of the geographical societies of the earth. I told him the encouragement I had received from the naval men was enough to carry me to the North Pole. I have chosen my own men ; men that will stand by me through thick and thin. Though we may be surrounded by innumerable icebergs, and though our vessel may be crushed like an egg-shell, I believe they will stand by me to the last. What has troubled me more than anything else is the selection of an astronomer. Not until the last moment have I been successful in getting a man that will venture on the expedition, and he will ever be remembered, for he has the boldest heart, and his name is Bryan. His parents are, I believe, in this audience. I met them for the first time to-day, and I can but thank them that they have given to the world a son who is willing to give up his life for science. I have selected a gentleman who has come highly recommended from Germany, and who will assume chief command of the scientific portion of the expedition. The work that he will have upon his hands will be equal to that of four ordinary men. Such men I have tried to get about me, and I have been successful.

#### THE ROUTE.

I propose to leave the port of New York and go into Davis Straits, first stopping at St. Johns, Newfoundland. The yellow of this chart represents the land, the blue the sea, while the white represents the area of the Polar region unknown. During no less than three centuries and a half have various nations been attempting to reach



the pole. Expeditions after expeditions have been organized and formed, and, after all, the highest elevation—the highest latitude—was that reached by Sir Edward Parry in 1827,  $82^{\circ}, 45'$ . After spending a few days at this island (Newfoundland), lying at about  $70^{\circ}$ , I shall cross Baffin's Bay, with the land of Greenland aboard, as we call it, on the starboard side, keeping between the drifting flood and the land line. After getting to Cape York, or a little above it, to Cape Diggs, I then expect to run on a parallel with Jones' Sound, latitude  $76^{\circ}$ . The land then trends to the northward. If I find land, and water will permit me to go to latitude  $80^{\circ}$ , I shall do so with the *Polaris*; but it may be that I shall encounter heavy pack ice coming out of Jones' Sound with the current, which comes to the eastward, which would drive me back. In this case I shall pursue the route of Dr. Kane, up Smith Sound. From what we know of the report of Dr. Hayes, I shall attempt the west side of Smith Sound. The reason why no further attempts have been necessary to be made on the east side of Smith Sound is that, by the configuration of this sea, the glaciers from the north throw down their icebergs and fill up this bay here, and spread to the southward where Kane had his winter quarters. You will recollect what Dr. Hayes now calls Kane Point, and because of that drift pressing upon that point he never was able to get his *Advance* out. Therefore, Dr. Hayes made no attempt to follow that course, but went into Port Hope. When he left, in 1861, he crossed directly over to Cape Isabella, and from the heights of Cape Isabella he saw to the north an opening next to the land that would have admitted, had he had a steam vessel, of his going something like fifty miles to the northward, where he would undoubtedly have still found open water.

I say, failing in Smith Sound, I shall go into Jones Sound; and failing to find a way between the land and the ice, I shall go back, and perhaps take harbor where

Dr. Hayes took his ; perfectly satisfied to let that be the basis of my operations in reaching the North Pole. I have no idea of getting the *Polaris* higher than latitude  $80^{\circ}$  this year. The balance of the distance, 600 miles, is only 600 geographical miles, or 702 English, making the journey to the Pole 1,400 English miles. The journey from latitude  $80^{\circ}$ , from the harbor, I shall make in April of next year. The animals used for draft will be dogs. No one estimated the value of dogs higher than Dr. Kane. The English think but little of them from the fact that they seldom or never used them. I have before now made a journey of 600 miles for the purpose of getting dogs to increase my team.

At Disco and other places in the upper part of Greenland I expect to get my dogs, and shall take great pains in selecting them. Having gone into winter quarters a month or two before starting, the dogs will be well fed up ; and I have found that the Esquimaux make their dogs draw from 350 to 400 pounds each. Dr. Kane found that they could draw 600 pounds. The Esquimaux make them draw more from the peculiar way in which they use their sledges. They shoe them with ice, so that the attrition with the crystals of snow, or friction, is hardly anything, while if you have polished steel or iron, with the thermometer at  $30^{\circ}$  or  $40^{\circ}$  below zero, the attrition is much greater. I shall start from latitude  $80^{\circ}$  with no less than five sledges, each sledge drawn by fifteen dogs and accompanied by two men. The five or six sledges starting for the Pole will be fully provisioned, and when the provisions of one sledge are nearly exhausted, the remaining four will continue on, while the other returns at once. When the provisions of another sledge are exhausted it will also return, the other three continuing on. This arrangement will be carried out until the final 100 miles is made by the last sledge. Whether I shall find a continuation of land beyond Grinnell Land on to the Pole I do not know, but I am prepared to see open water ; and

should I find this, then I shall go on by portable boats. Any Arctic traveler would prefer to find open water, for the hardest work men have done is that of sledging.

I have been reminded that I must be as brief as possible, as I must repeat my explanation in the other room. I shall also take occasion there to ask Dr. Bessels, our naturalist, to say a word or two before his departure.

The company, at the conclusion of Captain Hall's remarks, repaired to the adjoining room, where a flag was presented to Captain Hall and his party by Mr. Henry Grinnell, in the following speech :

#### SPEECH OF MR. GRINNELL.

This is quite a noted flag, and has seen peril by land and peril by sea and ice. In 1838 it went with Wilkes' expedition to a higher latitude toward the Southern Pole than any American flag ever went before. In 1850 the flag was presented to me by Lieutenant Walker, who took it to the Southern regions, with the request that I would loan it to De Haven. He took it to a higher latitude in the Northern regions than any other flag had ever been. Dr. Kane took it, with another expedition, to a still higher northern latitude. When Dr. Hayes went on his expedition I loaned it again to him, and he carried it about thirty-seven miles higher than an American flag had ever been before.

Now, I give it to you, sir. Take it to the North Pole, and bring it back a year from next October.

#### REPLY OF CAPTAIN HALL.

I really feel from the bottom of my soul that this flag, in the spring of 1872, will float over a new world ; a new world, in which the North Pole star is its crowning jewel.

JUDGE DALY, LADIES AND GENTLEMEN : We are very familiar with the name of the German geographer, Dr. Petermann. The world is more indebted to him than to any living man, for acquisitions in respect to every branch

of geography that involves new discoveries ; but particularly in respect to the exploration of the Arctic. He, himself, as you are aware, projected an expedition. The gentleman who goes out in the present expedition as a naturalist has done so under the inspiration of Dr. Petermann. I propose, therefore, introducing to you Dr. Bessels, who will make a remark or two.

## REMARKS OF DR. BESSELS.

I am deeply satisfied, ladies and gentlemen, to be one of your guests to-night, and you will allow me to give expression to my feelings in a few words. I am not very familiar with the language of your country as yet, but I think I may be capable of understanding and appreciating the kind nature of your invitation, such universal language of the heart which binds together men devoted to science. Perhaps, under other circumstances, it would have been better to postpone the reception you give to the members of our expedition until we return, until our deeds will speak for us ; but fortunately we have a commander, I mean Captain Hall, whose enthusiasm in support of Arctic explorations will justify the belief that he will succeed. If anything could be an additional stimulus to us during our trip, I think it will arise from the fact that such eminent men of science, such as compose this Society, are watching with interest the actions of our expedition, and are scrutinizing the results of our work.

Colonel Myers, in behalf of Mr. Octave Pavy, here came forward and said :

I am requested by my friend Mr. Pavy, who was with us at our last meeting, and is now about to set forth on an expedition toward the Pole, to return to the Society his sincere thanks, which he would himself convey if more familiar with our language. He desires me to say on his behalf that he will make the Society the medium of his communications with the scientific world, should he be successful in his operations, and will leave New

York with the most grateful appreciation of the consideration which has been shown him by the Society.

REMARKS OF A MEMBER IN RESPONSE — MR. FRANCIS  
A. STOUT.

The Society hopes Mr. Pavy will favor us with the results of his observations in the Arctic Circle, and will send us, as he may be able, sketches, photographs and manuscript results of his search, so that he may give to the world, through this Society, and through no other, an account of his explorations and discoveries.

THE PRESIDENT.

Mr. Pavy requests me to return an answer in the affirmative to your request. I desire very much, ladies and gentlemen, that Mr. Morton should say a word to you; but he is more accustomed to discovering open Polar seas than opening his mouth. His name has become a historical one. It is associated with the names of Kane and Hayes, with our first Arctic exploration, and he is now to be associated with the present expedition. The warm wishes of this Society, and the warm wishes of his countrymen, will accompany him especially, together with Captain Hall and all their brave associates. The remaining duty, ladies and gentlemen, is to invite you to retire to the adjoining room, where a collation has been prepared.

I am requested again to introduce Mr. Morton to the audience, as he happens to be here now.

MR. MORTON'S SPEECH.

LADIES AND GENTLEMEN: I am placed in a position that I am not fit to hold at the present time. I would be more at home under my commander, yoked on to a sledge or pushing our way through Baffin's Bay, than in standing before an intelligent audience such as I see here. You are, I suppose, well acquainted with my former proceed-

ings, I having been a member of the first and second Grinnell expeditions in search of Sir John Franklin. It was my sad fortune to lose as brave a man as ever lived. He has passed from among us into a world where martyrs receive their reward. I would have gone to the end of the world with him under any circumstances, and it was his intention to go again to the North Pole or up to the Arctic regions, and of course I was to accompany him ; but between getting hold of, and losing my former commander, I gave up the idea of ever going again to the Polar regions, until some nine months ago, Captain Hall, knowing me by reputation, was kind enough to come to me and ask me to accompany him. I was almost too glad of the honor that he offered. I belong to Captain Hall's party, and I don't see, ladies and gentlemen, that there will be any difficulty in reaching the Pole.

Dr. Kane's small, emaciated crew, after starving and freezing, after the terrible winter that we spent in those regions, accomplished 1,400 miles under most extraordinary circumstances ; sometimes dragging our boats on sledges, and then putting our sledges in boats, as ice and water intervened between us. We were eighty-six days on short allowance ; but we bore it with the courage and patience of men who had a duty to perform, and we were willing to do so. The water that is spoken of by Dr. Kane in his interesting narrative I have seen, and I believe now, as I believed then, the open Polar Sea was before us. I don't want any person to take my word for it. I am willing to show it to my commander, and to go into that sea and see whether it exists at all, and, if so, to what extent. I thank you, ladies and gentlemen, for your kind attention.

THE PRESIDENT.—I shall ask Captain Hall to point out again the proposed route on the map, after which we will adjourn to the other room.

## CAPTAIN HALL'S REMARKS.

My intention was, in fact my orders were, to leave here to-morrow, but owing to delays, the public being responsible for a portion of them, it is not likely that we shall leave the port of New York until Thursday next. After leaving here, in about one week we will reach St. John's, and spend some three or four days there recoaling. Then we go on to the northward, keeping with this channel between the Labrador coast and Greenland. A vessel from France is expected every day now, the vessel that took our charities to the French people. As soon as she arrives, she will take about three hundred tons of coal and one hundred tons of provisions. The rendezvous is at Disco Island, first touching at Holsteinburg. If no ice obstructs, the rendezvous is to be at Upernavik. Taking aboard additional coal, filling up the *Polaris* to the utmost capacity, and taking provisions, I bid farewell to the civilized world. Whether you will hear from me at the end of one year and a half or five, I know not. I am going with the determination to conquer. This store of provisions that we shall take aboard will answer for loading down the *Polaris*; then, if at any time they should fail us, we can return to the place where we shall have left a large quantity of provisions, and then we can fight back again until we reach the North Pole. My instructions from the Secretary of the Navy are, on reaching Cape Diggs to go in such direction as I choose, trying, if I please, Jones Sound. After entering Jones Sound about 100 miles, then will commence my duty of trying to discover and reach the Pole. On reaching latitude  $80^{\circ}$ , as I remarked before, I expect to go into harbor and there remain during the Arctic winter. The absence of the sun during my next winter will be 120 days, and the following winter, six months. On reaching that point called the North Pole, the north star will be directly over head. Without an instrument, with merely the eye, a man can define his position when there. Some astronomers tell me I will

find a difficulty, when getting near the North Pole, in determining my position. It will be the easiest thing in the world. Suppose I arrive at the North Pole and the sun has descended. Suppose there is an island at the North Pole; around it is the sea. I see a star upon the horizon; that star will remain on the horizon, if I were to remain a thousand years at the Pole, without varying one iota in height. Then, again, when I am at the Pole on the 23d of June, I take the latitude of the sun; just  $23\frac{1}{2}^{\circ}$  high at one and all hours. Five days before the 24th of June, and five days after, with the finest instruments we have, you cannot determine one iota of change. Therefore you will see that it is the easiest thing in the world to determine when you arrive at the North Pole. The phenomena displayed there will be deeply interesting, provided there is land there; and I am satisfied, from the traditions I have learned from the Esquimaux, that I will find land there.



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